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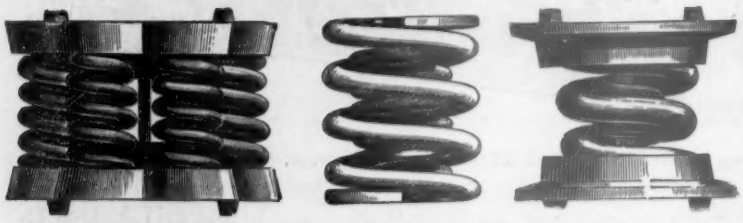

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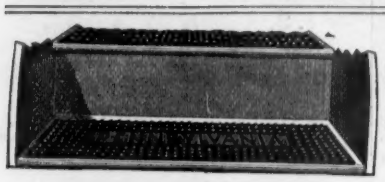

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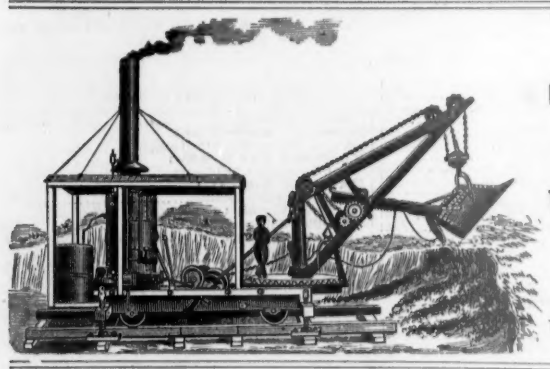

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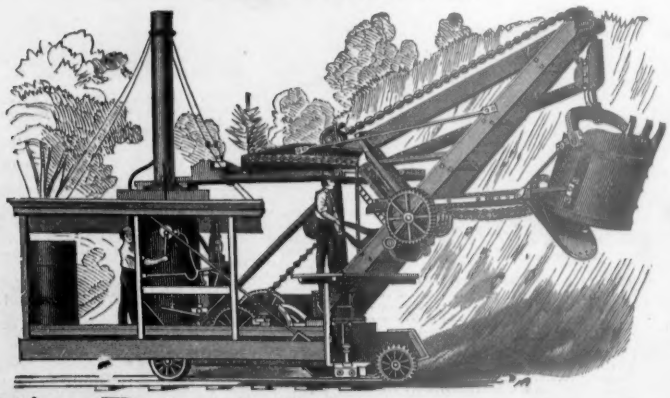

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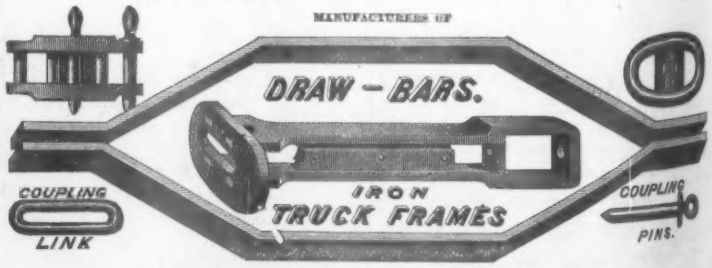

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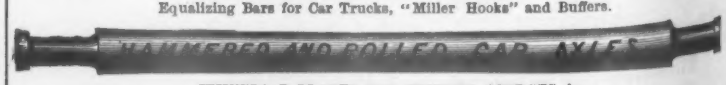

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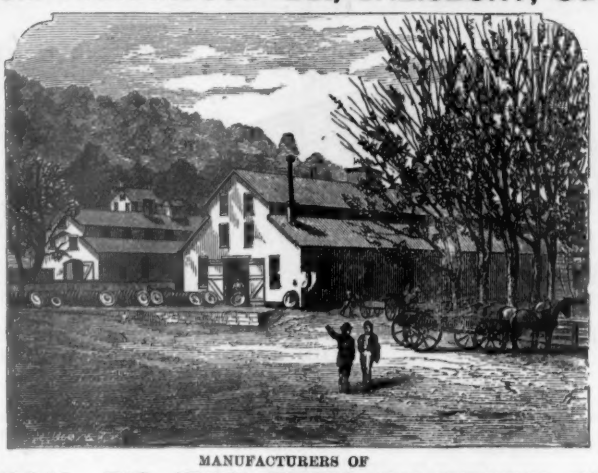

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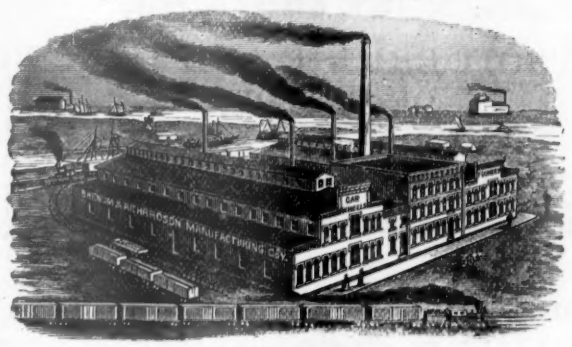

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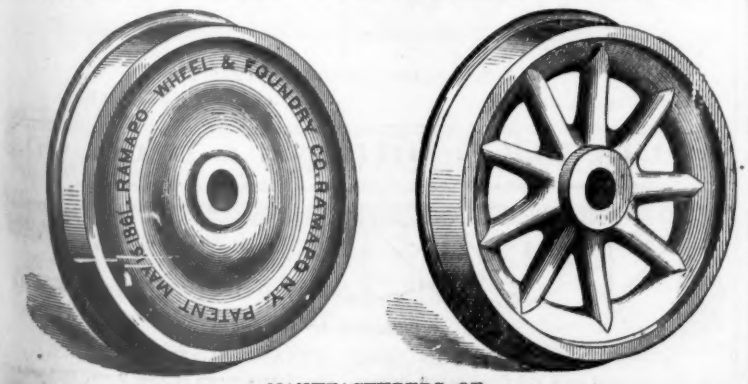

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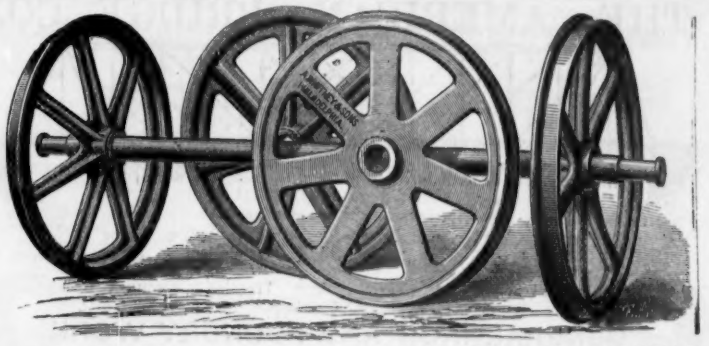

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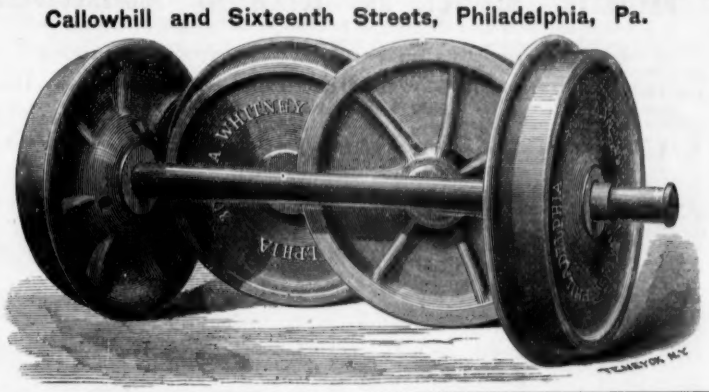

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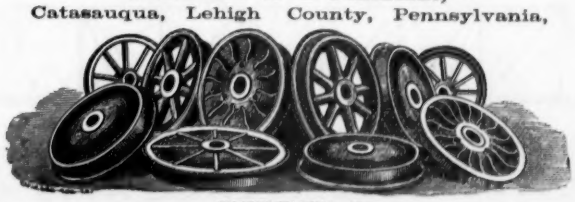

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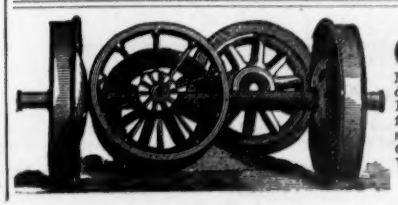

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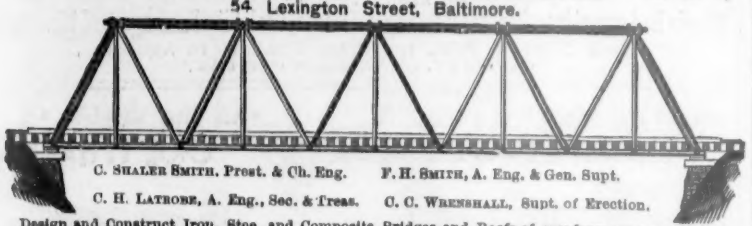

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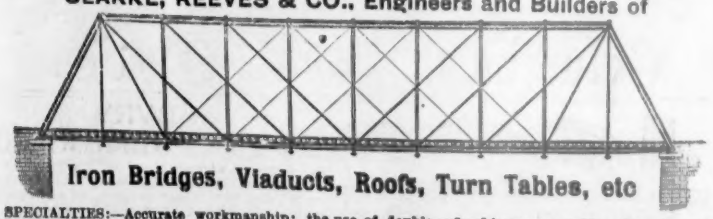

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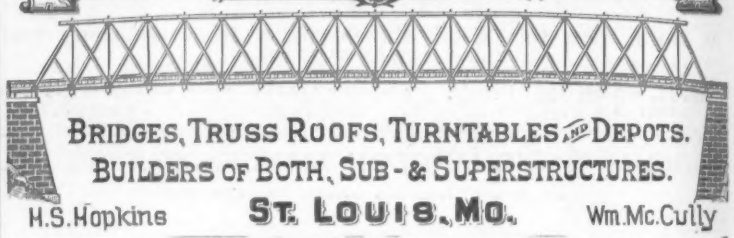

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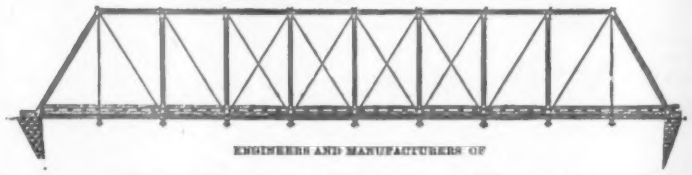

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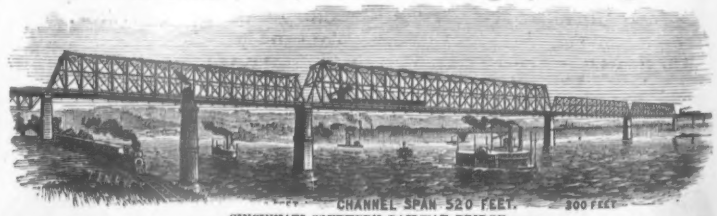

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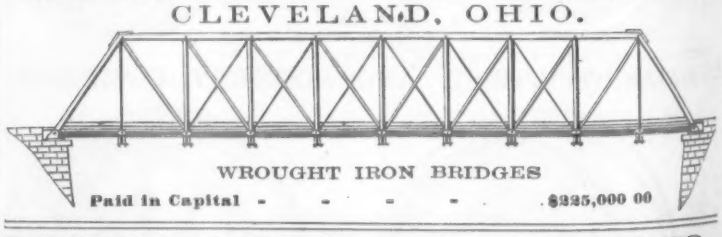

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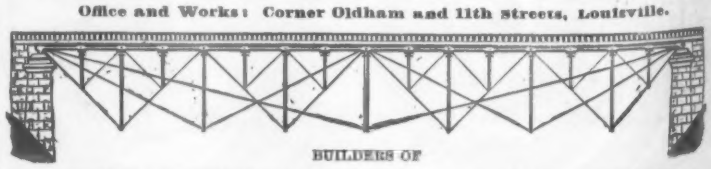

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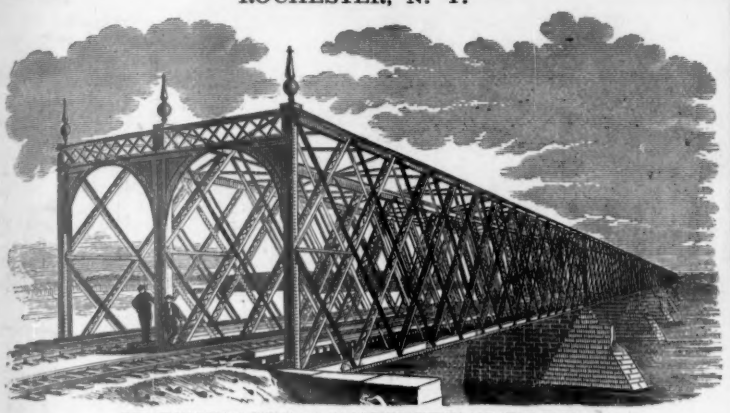

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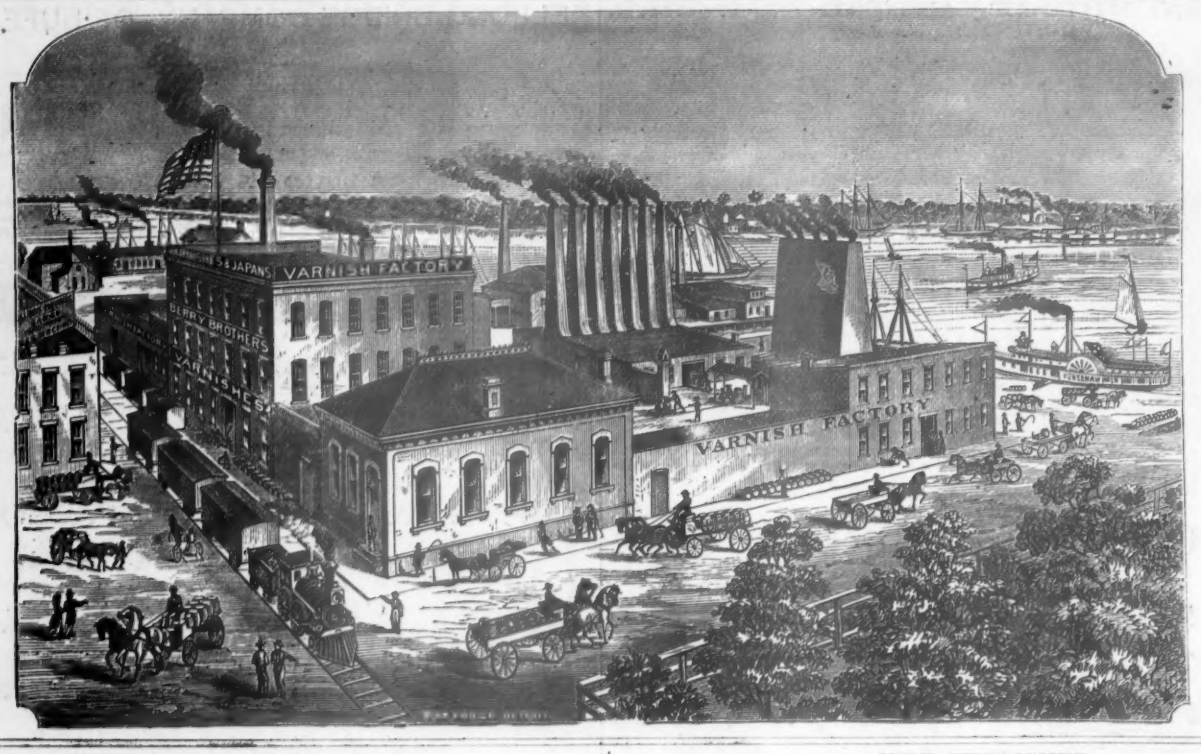

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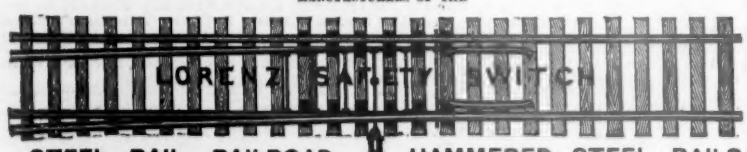

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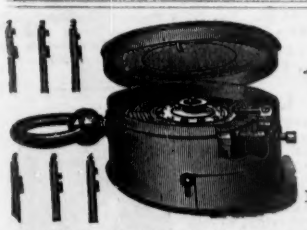

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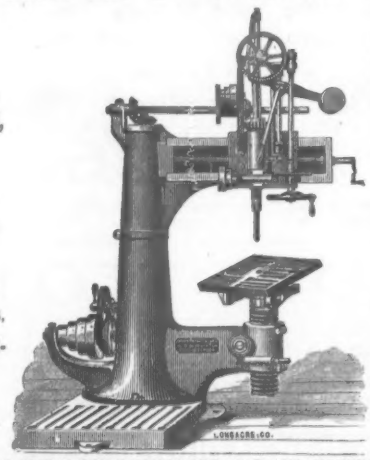

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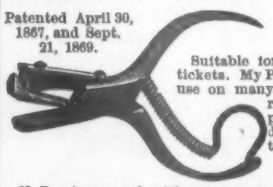

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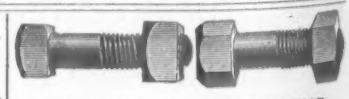

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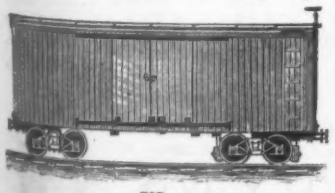

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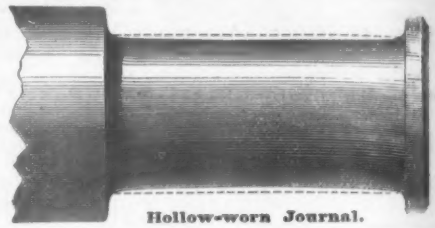

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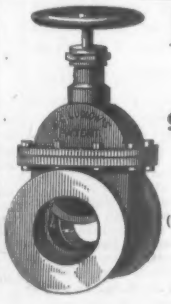

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History of the Rogers Locomotive and Machine Works.

We are permitted to publish the following extracts and engravings from a volume recently published by the present proprietors of this establishment:

Thomas Rogers, the founder of the works at Paterson, N. J., which bear his name, was born March 16, 1792, in the town of Groton, county of New London, Conn. He died in New York city, April 19, 1856.

He served in the war of 1812, and was a lineal descendant of Thomas Rogers, one of the Pilgrim Fathers who came over to this country from England in the Mayflower.

At the age of sixteen he was apprenticed to learn the trade of a house-carpenter, and in the summer of 1812, he removed to Paterson, N. J., then a small village—but prosperous on account of the demand for American manufactures brought about by the war with Great Britain.

The peace of 1815 reduced many of the manufacturers to bankruptcy. Mr. Rogers was then employed as a journeyman carpenter, and was noticed for his constant application to business, good judgment and force of character.

A few years afterward, Captain Ward, who had been traveling in Europe, where he had witnessed the power-loom in operation, came to Paterson for the purpose of introducing the manufacture of cotton duck. Mr. Rogers was employed in making the patterns for his looms, and taking hold of the idea, he purchased from Captain Ward the patent right for making them.

In 1819, he associated himself with John Clark, Jr., the firm taking the name of Clark & Rogers. They commenced work in the basement story of the Beaver Mill, a building which at an early day had been put up by Mr. Clark's father. Shortly afterward, Mr. Rogers visited Mexico where he received large orders for looms, etc.

In 1820, the firm moved into the Little Beaver Mill, and in the following year took into partnership Abram Godwin, Jr., the firm changing the name to Godwin, Rogers & Co. They now commenced spinning cotton and building machinery for that and other purposes.

In 1822, finding their accommodations too limited, they leased Collett's Mill and moved thither. Their business kept increasing, the number of persons employed being sometimes as high as 200. The establishment continued prosperous till the summer of 1831, when Mr. Rogers withdrew, taking with him $38,000 as his share of the profits of the concern. This was in the latter part of June.

Having taken a mill site on the upper raceway, he immediately commenced the erection of the Jefferson Works, which were finished and put in operation before the close of the next year. His design was to occupy the lower stories in building machinery, and the upper stories in spinning cotton. The latter, however, was never commenced, the demand for machinery increasing in a short time to the full capacity of the works.

* * * * * * * * *

In the early part of 1832, Mr. Rogers associated with himself Messrs. Morris Ketchum and Jasper Grosvenor, of New York, under the title of Rogers, Ketchum & Grosvenor. About this time public attention began to be directed to the construction of railroads and railroad machinery.

The railroad from Jersey City to Paterson was then approaching completion, the iron work for the Passaic and Hackensack bridges being made by Mr. Rogers. An order was also executed for one hundred sets of wheels and axles for the South Carolina Railroad.

Mr. Rogers next commenced making wrought iron tires for car wheels, and, after some difficulties, succeeded.

Preparations for locomotive building had been made by Paul & Beggs, and they had a small engine nearly completed, when the building took fire and was consumed, the locomotive being destroyed.

THE FIRST LOCOMOTIVE AND ITS HISTORY.

In 1835 some buildings were begun by Rogers, Ketchum & Grosvenor, with a view to the manufacture of locomotives. It was not, however, until eighteen months afterward that the first locomotive—the "Sandusky," (Fig. 1) was completed. On the 6th of October, 1837, a trial trip was made from Paterson to Jersey City and New Brunswick and back, Mr. Timothy Smith acting as engineer. The performance of the engine was entirely satisfactory; the gauge of the road was 4 ft. 10 inches, the same as that of the New Jersey Railroad and Transportation Co., for which road the engine was intended. It was, however, bought for the Mad River & Lake Erie Railroad by its President, Mr. J. H. James, of Urbana, Ohio, and on the 14th, it was shipped via canal and lake, in charge of Mr. Thomas Hogg, on the schooner "Sandusky." Mr. Hogg had worked upon it from its commencement. It arrived at Sandusky Nov. 17, 1837, at which time not a foot of track had been laid. The road was built to suit the guage of the engine, and the Legislature of Ohio passed an act requiring all roads built in that State to be of 4 ft. 10 in. gauge, same as the engine Sandusky.

The engine was used in the construction of the road until the 11th of April, 1838, when regular trips for the conveyance of passengers commenced between Bellevue and Sandusky, a distance of 16 miles.

The engineer was Thomas Hogg, who ran the engine for three years, keeping it in repair. The engine continued in service many years, until engines of larger size were required to do the work.

Mr. Hogg subsequently became Master Mechanic of the Mad River Railroad, and continued in that capacity on that and other roads for about thirty years.

The "Sandusky" had cylinders 11 in. diameter by 16 in. stroke, one pair of driving wheels of 4 ft. 6 in. diameter, situated forward of the furnace; the truck had four 30-inch wheels, the eccentrics were outside of the frame, the eccentric rods extending back to the rock shafts, which were situated under the footboard; the smoke pipe was of the bonnet kind, having a deflecting cone curled over at the edges in its centre, so as to deflect the sparks downward, and thus prevent their passing through the wire bonnet, as well as preventing the bonnet's wearing out too fast.

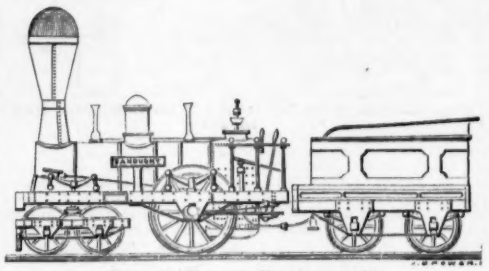

Fig. 1.—Rogers Engine, 1837.

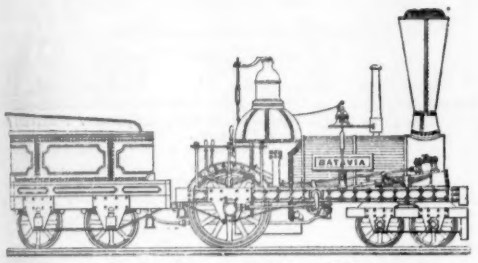

Fig. 2.—Rogers Engine, 1838.

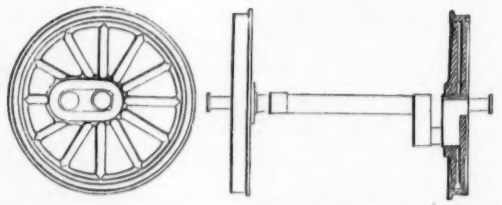

Fig. 3.—Driving Wheels and Axle with Crank let into Wheel.

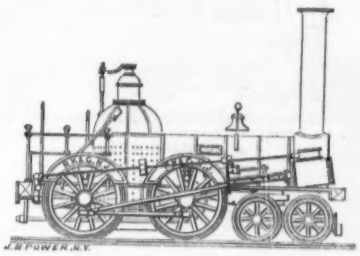

Fig. 4.—Rogers 8-wheeled Engine, 1844.

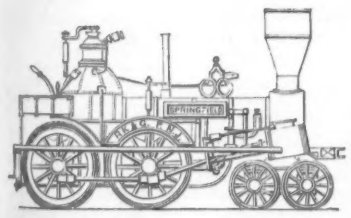

Fig. 5.—Rogers Eight-Wheeled Engine, 1845.

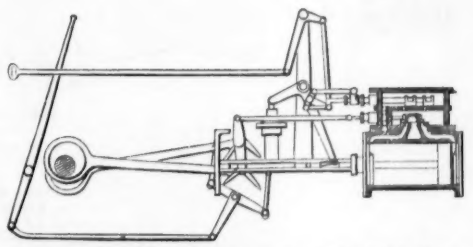

Fig. 6.—V Hooks and Independent Variable Cut-off on separate face. 1845 and 1846.

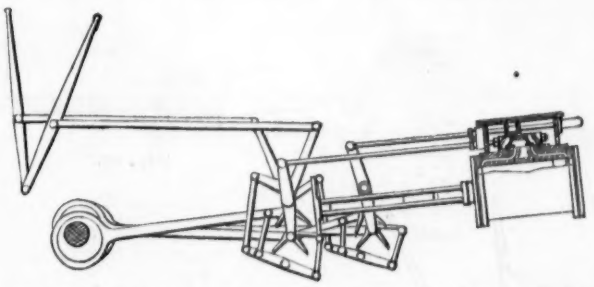

Fig. 8.—Style of V Hooks and Independent Cut-off Valves as introduced in 1847.

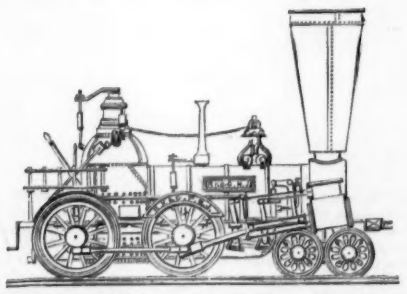

Fig. 7.—Rogers Eight-Wheeled Engine, 1846. V Hooks and Independent Cut-off on the back of Main Valve.

COUNTERBALANCING.

In this engine, Mr. Rogers introduced several important improvements, among which we may mention "counterbalancing," for which he filed a specification in the Patent Office, dated July 12, 1837. It is thus described in the specification:

"The nature of my improvement consists in providing the section of the wheel opposite to the crank with sufficient weight to counterbalance the crank and connecting rods, making the resistance of the engine less in starting and in running; also preventing the irregularity of motion caused by that side of the wheels when the cranks are placed in the usual mode of fitting them up. The irregular motion which arises from not having the cranks and connecting rods balanced is attended with much injury to the engine and to the road, and with much loss of power."

The importance of "counterbalancing" was not recognized as being necessary until several years after it had been introduced by Mr. Rogers, and, when attention was drawn to it, many doubted the necessity of balancing anything more than the cranks.

There was also another remarkable novelty introduced by Mr. Rogers in the "Sandusky." It consisted in making the driving wheels with hollow spokes and hollow rim; the rim on the side opposite to the crank being cast solid. The spokes were oval, and the rim very much of the same shape as at the present time. This kind of driving wheel is in almost universal use in this country at present.

It will be seen, from an examination of this engraving, that the engine differs from the English style in having a four-wheeled truck in front, as also in other important particulars already mentioned.

The second locomotive built by Mr. Rogers was called the "Arresseoh" (Fig. 2). It was completed in February, 1838, for the New Jersey Railroad & Transportation Co. It was similar in design to the "Sandusky."

THE "CLINTON," "EXPERIMENT" AND "BATAVIA."

The third engine differed from the first one in its cylinders, which were 10×18-inch stroke, and the gauge was 4 ft. 8½ inches. Both the driving and truck wheels of this engine had hollow oval spokes, and hollow rims with wrought-iron tires. This engine, which was named the "Clinton," was built for the Lockport & Niagara Falls Railroad, and was delivered to them in April, 1838. It was run by Wm. E. Cooper until November, 1843, when it was sold to the Toledo & Adrian Railroad for $6,500 (the first cost). Mr. Cooper says that when the engine was sold it was considered to be one of the best working engines in existence.

An engine called the "Experiment" was the next or the fourth locomotive turned out. It was made for the South Carolina Railroad, and was delivered in June, 1838. This engine differed from the ones previously built at these works in having a smaller cylinder and longer stroke than usual.

The fifth engine was called the "Batavia." It was made for the Tonawanda Railroad, and was completed in October, 1838.

This engine differed from the previous one in having the driving wheels back of the furnace, which was semi-circular at the rear part, and had a hemispherical top surmounted with a dome. The engine had an arrangement by which a part of the weight of the tender could be transferred to it, so as to increase the adhesion, should it be found necessary to do so.

AMERICAN LOCOMOTIVES IN 1839.

We copy from the *American Railroad Journal and Mechanics' Magazine* of 1839 an article on American Locomotives. The editor says:

"A few days ago, in company with one of the proprietors, we had the pleasure of a visit to, and inspection of, the very extensive works of Messrs. Rogers, Ketchum & Grosvenor, at Paterson, New Jersey, for the construction of various kinds of machinery. Our attention was principally directed to the shops for the construction of locomotives, the main building of which is 200 feet long and three stories high, and another of equal length, containing nearly 50 forges, most of which were in operation, notwithstanding the pressure of the times.

"We saw a number of engines in different states of forwardness, and though the general forms are those of 6-wheeled American engines in general, we were not a little gratified with several minor arrangements, new to us at least, which have been introduced by Mr. Rogers, and to which we shall briefly refer.

"The wire gauze of the smoke pipe is protected by an inverted cone, placed in the axis of the pipe, a few inches below the wire gauze. The base of the cone is curled over so as to scatter the sparks over a large portion of the surface of the wire cloth, and to prevent the top of the spark-catcher from being burnt out before the rest of the wire cloth is materially injured; it also tends to throw the larger sparks down between the pipe and the casing, and will do something towards diminishing this standing reproach.

"The truck frames, whether of wood or iron, were admirably stiffened by diagonal braces, and where the crank axle is used, the large frame is very strongly plated in the manner of Stephenson's engines, the neglect of which till very lately has been, we are informed, a constant objection to the Philadelphia engines on the Long Island and Troy railroads.

"The wheels are of cast iron, with wrought iron tires; the spokes are round, and they, as well as the rims, are hollow, except where the crank axle is used, when the rims are cast solid on one side so as to counter-balance the cranks.

"Our readers will probably remember an article on this subject in the *Journal*, Nos. 7 and 8, page 244 of the present volume, on 'side motion or rocking,' by C. Heaton, where its success on the Birmingham railroad has been complete.

"Mr. Rogers balanced his *first* engine *wheels* two-and-a-half years since, and entered a specification, not with the intention of taking out a patent, but to prevent any one else from doing so; and thus deprive the community of the benefit which Mr. Rogers was desirous of conferring, and which we understand other makers are now availing themselves of. The advantages are fully explained in the article referred to.

"When the crank axle is used, the eccentric rods and the cranks of the rockshafts are placed on the *outside*, where they are easily got at, and where they are not crowded into the smallest possible space, as with the ordinary arrangement. For this also a specification was entered with the same object as in the preceding case.

"But we were most pleased with the arrangement of levers to which the eccentric rods are *fastened*, and thus the *reversing* depends on no contingency, for the rods are *forced* in and out of gear; a single handle only is required to manage the engine much more rapidly and efficiently than by the ordinary mode. The boilers are 8 ft. long for an 8 ton engine, with 120 flues, the usual length of the former being, we believe, 7 ft., and the number of the latter about 80 or 90; by this deviation the area

of heating surface is increased, and the heat remains longer in contact with the flues, while the addition to the weight is very trifling compared with the advantages derived from the saving of fuel.

"Mr. Baldwin, of Philadelphia, took out a patent some time since for a very ingenious mode of saving half the crank, by inserting the wrist into one of the spokes of the driving wheels, and this has been very closely imitated, by making one complete crank, and by letting one-half of it into a spoke which is cast larger than the others, with a receptacle for the purpose. This latter plan has been adopted by Mr. Rogers and others in this neighborhood, while the Boston machinists aim at bringing the two cranks as near together as possible. The relative merits of straight and cranked axles are so well pointed out in Mr. Wood's papers on locomotives in these numbers, that we shall merely beg leave to state that the plan of Mr. Baldwin, and its imitation, appear to us to combine the liability to fracture of the crank axle with the loss of heat, the exposure to accident and the racking of frame and road ascribed to the straight axle, for the only difference is the thickness of the spoke; the loss of heat is the same in both; the protection against any serious accident is too trifling to be considered, while, with the cranks as close together as possible, the cylinders are completely protected.

"We offer these remarks as our views merely, and with all due deference to the superior skill of Messrs. Baldwin and Rogers. Mr. Rogers, in common with all other experienced machinists with whom we have conversed, is decidedly opposed to any increase of width of track, beyond 5 ft., with the present weight of engine.

"As regards the power of the engines, they are able to slip the wheels when the rails are in the best state; this they do in common with all good American or English engines, consequently any accounts of extraordinary performance would be worse than superfluous, when we *know* that they will do all that any other engine whatever, with the *same* weight on the driving wheels, possibly *can do*.

"As a last remark, we would observe, that there is rather more finish on the engines of Messrs. Rogers, Ketchum & Grosvenor than we are in the habit of seeing; some parts usually painted black being highly polished. On the whole, we consider their new establishment eminently calculated to add to the reputation of American Locomotives, as it has for many years largely contributed to the character of American machinery for the manufacture of cotton and other objects."

THE GROWTH OF LOCOMOTIVE INDUSTRY.

In the year 1838, seven engines were turned out, after which the production was gradually increased each year until 1854, in which year 103 engines were built.

In 1856, on the decease of Mr. Rogers, the concern was reorganized under a charter, with the title of the "Rogers Locomotive and Machine Works," under the charge of Wm. S. Hudson as Mechanical Engineer and Superintendent, he having been for a number of years previously the assistant of Mr. Rogers.

The works have been gradually enlarged and improved. * * * The concern is supplied with greatly improved tools and facilities for turning out accurate work; many of them are of new and approved design, and were manufactured expressly to the order of the company.

The present capacity of building locomotives is equal to one a day.

* * * * * * * *

VARIOUS STYLES OF LOCOMOTIVES AND VALVE-MOTIONS.

We have introduced illustrations of several styles of locomotives and valve-motions, made by Rogers, Ketchum & Grosvenor, believing they will be of interest.

This engine (Fig. 4) had eccentrics on the back axle, the pumps were full stroke, worked from the cross-heads, the springs were over the back axle bearings, and also in the centre of levers extending from driving axle to the centre of the truck on each side of the engine. The truck was pivoted and turned upon a centre-pin fixed to the boiler; the arrangement did not give satisfaction, and was altered after a short trial.

This style of engine (Fig. 5) had equalizing levers between the driving-wheel springs; the truck had side bearings and springs over the sides of truck; the pumps had short stroke, worked from cross-head as shown.

Figure 6 shows a valve-motion for locomotives, designed and used by Thomas Rogers as early as 1845. It serves to show the thought he was giving at that date to the subject of working steam expansively.

Figure 7 shows an engine with the driving-wheels spread well apart. It had V hooks and independent cut-off on the back of the main valves; this was a favorite kind of engine for many years.

Figure 8 shows one of the styles of valve motions introduced by Thomas Rogers, in the year 1847.

Figure 9 represents a plan of ten-wheeled engine, with half-crank keyed in the driving-wheel, same as Baldwin's plan. The engine had outside bearings and equalizing levers between the springs; it also had cranks on the axles outside the frames to which the coupling rods were attached. A number of engines on this plan, with cylinders 17×22, was built for the New York & Erie Railway. They all had independent cut-off valves.

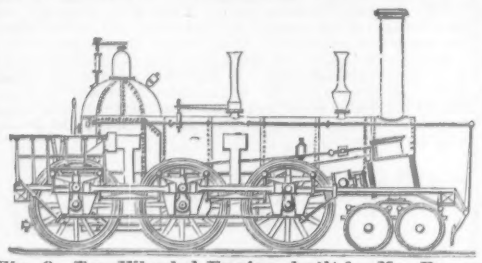

Fig. 9.—Ten-Wheeled Engine, built by Mr. Rogers in 1848.

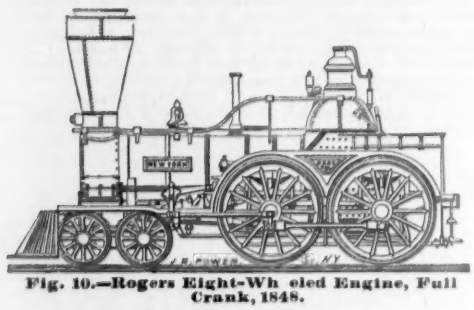

Fig. 10.—Rogers Eight-Wheeled Engine, Full Crank, 1848.

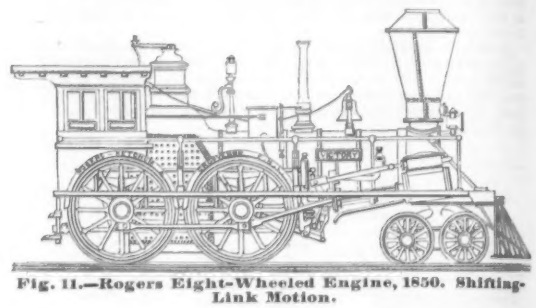

Fig. 11.—Rogers Eight-Wheeled Engine, 1850. Shifting-Link Motion.

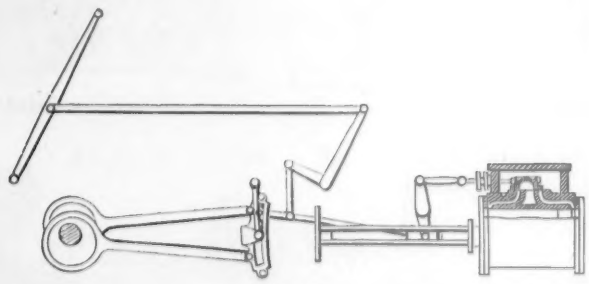

Fig. 12.

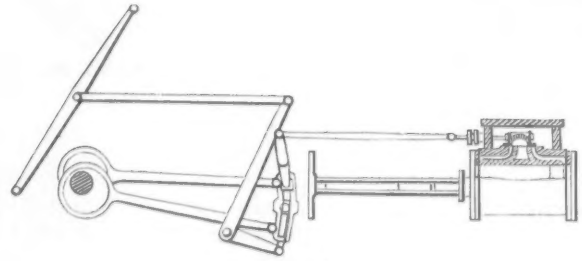

Fig. 13.

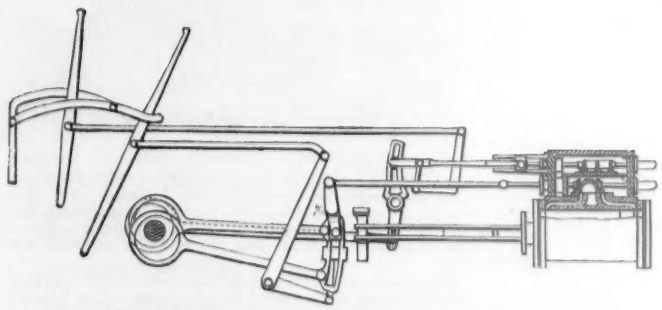

Fig. 14.—Link Motion and Variable Cut-off, 1854.

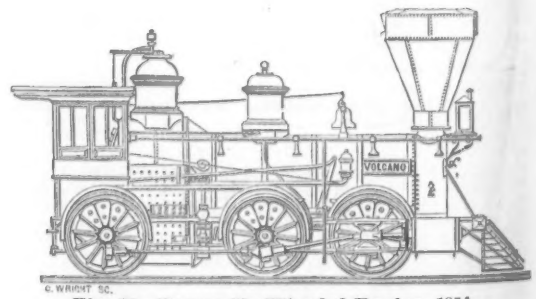

Fig. 15.—Rogers Six-Wheeled Engine, 1854.

Figure 10 represents an engine with full crank; the steam chests were inclined sidewise, so that the valves could be readily got at. This was one of the improvements introduced by Thomas Rogers. The engine had V hooks and independent cut-off valves, and was built for the Paterson & Hudson River Railroad.

On this style of engine (Fig. 11) the shifting-link motion was introduced. Thomas Rogers was one of its earliest advocates, and did more towards its successful introduction on American locomotives than any other person. He was not only an early but an earnest advocate of it, at a time when some people were styled fools for so doing; nevertheless, time has amply proved all that he claimed for it, viz.: that it is the most simple and efficient device ever made for the purpose.

Figure 12 shows a suspended link, as made by Thomas Rogers, in 1849.

Figure 13 shows a shifting-link motion, as made by Thomas Rogers, in 1850.

Figure 14 represents a combination of link motion, with an independent graduated cut-off. It was introduced on several locomotives, and was found beneficial in economizing fuel.

THE "M'NEILL."

The first locomotive on the Paterson & Hudson River Railroad was called the "McNeill." It was ordered by Judge Dickerson, then President of the road, in the year 1833, to be as good as possible, without regard to cost, and was built by Geo. Stephenson. It arrived and was put in operation in the year 1834. The cylinders were 9 in. diameter by 18 in. stroke, and one pair of driving-wheels 5 feet in diameter, which were behind the fire-box. The axle was cranked, and the cranks were close to the wheels; there was room for the connecting rods to pass by the outside of the furnace. The front end was supported by a four-wheeled truck; the fire-box and tubes were of copper.

This engine continued in use for many years, and was said to be very fast; it was finally sold to a Western road, the business on the Paterson & Hudson River road having grown beyond the engine's capacity.

INSIDE VS. OUTSIDE CONNECTED ENGINES.

Thomas Rogers, soon after commencing the building of locomotive engines, became convinced that inside-connected engines, with crank axles, were inferior in many respects to outside-connected ones, besides being more expensive to build and to keep in repair; he also became satisfied that in the matter of steadiness the inside-connected had no advantage over the outside-connected engine, and that, with proper counterbalancing, the latter could be run as fast as required without any injurious oscillation; and also that it required more skill to properly counterbalance inside-connected engines than outside ones. Therefore, he was an earnest advocate of this style of engine, and recommended outside-connected engines as better than inside-connected ones.

In the early inside-connected engines, Mr. Rogers followed the plan which is still used in England, viz.: putting the cranks for parallel or coupling rods opposite to the main cranks. He soon found that this arrangement, while it had some advantages, such as requiring less counterbalance, caused the journals of the driving axles to wear oval; he therefore adopted the plan of putting the cranks for both main and outside rods on the same side of the centre of the axle.

THE PREVENTION OF CRACKING BOILER PLATES.

In the construction of locomotive boilers, Mr. Rogers found that, in flanging the sheets, a great strain was put upon them, so much so as to endanger their cracking while being riveted together, or, if they did not crack when being riveted, they were likely to do so after being a short time in use. To remedy this evil he adopted the plan of taking out the strains—caused by flanging, punching and hammering—by heating the sheets red hot after they were prepared to be riveted together, and then allowing them to cool slowly. This plan was found so effectual with iron that it was a very rare thing to have sheets crack when in use; the same method was afterward adopted with steel sheets, and it has no doubt been the means of preventing many of these sheets from cracking, which would otherwise have done so while being worked soon afterward; still it is a well known fact that our knowledge of steel is not yet such that we can insure steel furnaces lasting for any great length of time without being liable to crack. We have no doubt, however, that the difficulty will be overcome, either by our being able to get a better material that is capable of withstanding all the strains without cracking, or by putting the material in such a shape as will accommodate all the expansions and contractions to which it is subjected while in use; or, to so proportion the water spaces as to allow better circulation to carry off the heat, thus preventing undue strains, either from expansion or contraction. If the latter plan is properly carried out, we feel confident that it will very materially add to the life of steel furnaces. We do not, however, expect that it will prove effective against the failure of poor steel, or steel not suited to the purpose.

The plan of placing the flues of the boilers in vertical rows is also one conceived by Mr. Rogers, as it gave more freedom, and offered less obstruction to the circulation of the water than the arrangement then in use.

EXPANSION PLATES.

Thomas Rogers was the first builder of locomotives to use expansion plates, so as to relieve both the boiler and frame from the strains due to the lengthening of the boiler when under steam, as well as to provide for its shortening when cold or cooling down. The system he adopted is now in general use.

THE "MOGUL."

The style of engine called the "Mogul" was first built at these works in the year 1863. It was made with two-wheeled Bissell trucks; swing links, on the plan of Mr. Smith's, instead of the Bissell inclined planes were afterward used. Another important improvement was introduced (patented by W. S. Hudson, the Superintendent of the works). It consisted in placing an arrangement of equalizing levers between the two-wheeled truck and the front driving-wheels, whereby both truck and driving-wheels maintain their proper portion of the weight, and accommodate themselves to the vertical, as well as to the lateral, motion required to enable the

engine to pass over uneven tracks and around curves with ease as well as with perfect safety.

* * * * * * *

CAST-IRON THIMBLES A REMEDY FOR LEAKY FLUES.

Twenty-five or thirty years ago a great deal of trouble was experienced on locomotive engines with leaky flues; it was a constant source of annoyance, and every few days some one had to go into the furnace to hammer or caulk up the ends of the flues and thimbles (the flues at that time were either copper or brass, and the thimbles were of wrought iron).

In the year 1850, W. S. Hudson, then Master Mechanic of the Attica & Buffalo Railroad, conceived the idea that if cast-iron thimbles were substituted for wrought iron it would remedy this standing reproach. Acting on this idea he proceeded to verify it—first by taking a thimble of each kind, wrought and cast-iron, turning them accurately to a gauge, then heating them red hot, measuring them, and noting the expansion of each: afterward, cooling them in water, and again measuring them. This process of heating, cooling and measuring was repeated twelve times or more, when the wrought thimble was found to be appreciably less than at first, and the cast-iron thimble appreciably larger. It was noticed that the former thimbles expanded more than the latter when red hot; this was as anticipated.

To carry this idea into practice, a locomotive with leaky flues was taken: All the thimbles were taken out, the flues carefully expanded, and new thimbles put in. One-half, or all on one side of the centre line of the flue sheet vertically, were of wrought iron, and the other half were all of cast iron. At the end of the first trip, when the boiler was cooling down, it was found that all the flues with wrought-iron thimbles were leaking, whereas, at the same time, all those opposite to them, with cast-iron thimbles, were tight. The wrought thimbles were then taken out and cast-iron ones put in their places, when all stopped leaking and so continued, the engine doing duty daily, without any more trouble from leaky flues. The attention of Thomas Rogers was called to the fact, and he began to use cast-iron thimbles with a like result. Mr. Rogers called the attention of John Brandt, then in charge of the motive power on the Erie Railway, to the subject; he, also, immediately tried cast-iron thimbles, and found the result as stated above, and hence, their use spread and became almost universal; few, except those who had experience in the matter at that time, can now realize how much annoyance and expense were saved by the change.

The Strength of Riveted Joints.

The strength of riveted joints is a matter of the utmost importance at once to civil and mechanical engineers and to shipbuilders. The former cannot dispense with rivets in the construction of wrought-iron girders, and we need not stop to point out how large is the interest which the boiler-maker and the naval architect has in efficiency of joints, the failure of which may at any moment cause the loss of many lives and the destruction of much property. A great deal has been written on the subject; and various but not numerous experiments have been instituted to supply materials for a reliable formula to be employed in calculating the strength of structures put together with rivets. But it cannot be said that we have reached anything like finality on the subject, although the tendency has been to accept Fairbairn's statements as incontrovertible, and engineers have for many years confidently assumed that the strength of a single riveted joint is equal to 56 per cent. of that of the solid plate, while a double riveted joint is equivalent to from 70 to 72 per cent. Joints loaded on these data have, however, now and then failed in a somewhat mysterious fashion; and a few individuals began to suspect that it was unnecessary to seek for occult causes for very simple events. It was only necessary to assume that the riveted joint which gave way was not so strong as it was supposed to be, and the "mystery" ceased to exist. Such a heterodox doctrine as this was not generally accepted; but we have no doubt that it is perfectly sound, and that it is extremely unwise, to say the least of it, to infer that in all cases the strength of a riveted joint must bear a nearly invariable relation to that of the solid plates. Some six or seven years ago a remarkable example of the untrustworthiness of the received formula came under our observation. A section of a seam of a new steam boiler, double riveted by power, was being tested in the presence of three engineers, who, after obtaining the dimensions of the plates, rivets, &c., made a calculation as to the stress which would be required to break it. These calculations agreed within a very little, the breaking load being assumed at about 90 tons. To the surprise of every one, the joint gave way with a strain of about 38 tons only. On another occasion, under somewhat similar circumstances, the disparity was still more widely marked. As facts of this kind are apparently of comparatively rare occurrence, they are usually rejected or explained away; but should it happen that in actual practice a joint which was supposed to be good for 90 tons gave way at 38 tons, no amount of explanation would prove satisfactory to those who were seriously injured themselves, or who lost relatives as a consequence of what they would not hesitate to regard as a manifestation of incompetence, if not of something worse, on the part of a boiler-maker or a bridge-builder.

The last report of Mr. R. B. Longridge to the Boiler Insurance and Steam Power Company contains a contribution to the literature of riveted joints which has a very important bearing on the questions we have just considered. Briefly, Mr. Longridge shows apparently very conclusively that Fairbairn's estimate is altogether too high, and that the strength of boiler seams and similar joints is not nearly so great as is usually supposed. It will be recollected that two new boilers exploded with extremely disastrous results at Blackburn in 1874; and it is possible that no previous explosion excited keener interest or led to hotter disputes among engineers. In order to set one point at rest, Mr. Longridge, as chief engineer to the Steam Boiler Insurance Company, instituted a series of experiments on the strength of riveted joints, which have been carried out by Mr. D. Kircaldy, and the results of which are consequently practically unimpeachable. The details have not yet been made public, but Mr. Longridge has given us enough to prove that Fairbairn's rules must be received in future with extreme caution. We commend the accompanying tables to the most careful attention of our readers. It will be well to explain that Mr. Longridge used plates in two different conditions—that is to say, some were annealed and others were not—the result being a remarkable difference in the strength of the joints. Let us take, for example, the two first experiments in the table. Here we find that, while the resistance of a single-riveted joint of unannealed plates was 38.9 per cent. of the strength of the solid plate, the mere act of annealing raised the ratio to 45.7 per cent. The most noteworthy point is, however, that, whether the plates were or were not annealed, in only one instance was the result consistent with the 56 per cent. theory. It is true that one joint had a strength of 60 per cent. of that of the solid plate, but it will be seen that it was arranged at an angle of 45 deg. with the line of strain. The length of the joint, therefore, was greater than the width in the ratio of about 1.4 to 1. It is also worth notice that the strength of the joint appeared to be quite independent of the manner in which the joints were made—that is to say, punching gave just as good results as drilling. All the plates were made by the Snedshill Bar and Bolt Iron Company, while the rivet iron and the rivets were made by Messrs. W. & J. Galloway & Sons, who also put the plates together, so that there is no room to doubt that the workmanship was as good as it could be. We venture to think that with these experiments before the world it will hardly be safe in future to assume that the strength of a riveted joint is certainly equal to 56 per cent. of the plate.

When we turn to double-riveted joints it will be seen that the result is the same. Their strength is not in any case found to be equal to 70 per cent. of that of the solid plate. Single-riveted butt joints were found to be much stronger than the plain joints. It appears that on the whole the best seam which it is possible to use, for boiler shells at all events, is the butt joint double *chain* riveted. And as this system of putting work together is readily used, we shall allow Mr. Longridge to speak for himself concerning it:

"The effect of adhesion is well illustrated in the double-riveted butt joints; for instance, in the joints made of ⅛-in. plates, with rivet holes punched 3 in. pitch, where the rivets were $\frac{13}{16}$ in. diameter, with a sectional area—calculated for 'double shear'—more than double the net sectional area of plate between the rivet holes, the ratio of joint to solid plate was 67 per cent., whereas with rivets ⅝ in. diameter, the sectional area of which—calculated in the same way—was as nearly as possible equal to that of the plate between the rivet holes, the ratio of joint to solid plate was only 62.4 per cent. In each case the joint failed from fracture of the plate, thus proving that even the ⅝ in. rivets were stronger than the plates. With drilled holes ⅝ in. diameter and 3 in. pitch in ⅜-in. plates, the rivets and plate were as nearly as possible equal in strength, as shown by one of the joints failing from shearing of the rivets with slight fracture of the plate at the rivet holes, and the others from fracture of the plates. It will also be seen that with rivets of the same size and pitch, but thinner plates, the latter being only $\frac{7}{16}$ in. thick, the excess of strength in the rivets made a stronger joint, the ratio of joint to solid plate rising to 66.9 per cent. The diagonal joint with the same pitch and size of rivets showed a further increase of 2.3 per cent., the ratio of joint to solid plate being 69.2 per cent. The superiority of 'chain riveting,' or arranging the rivets in parallel lines instead of 'zigzag,' was clearly proved; for it will be observed that in the joints made of $\frac{7}{16}$ in. plates with ⅝ in. rivets and 2¼ in. pitch 'chain riveted,' the ratio of joint to solid plate was 67.2 per cent., whereas with plates of the same thickness and rivets of the same size arranged 'zigzag,' with 3 in. pitch, the ratio was only 66.9 per cent.; and, again, comparing the joints made of ½ in. plates and ¾ in. rivets, the relative strength of the joints, 'chain riveted' and 'zigzag,' was as 66.2 to 63.3, the former being 2¼ in. and the latter 3 in. pitch. It will thus be seen that by 'chain riveting' equal, if not greater, strength may be obtained with a smaller pitch, an advantage of no small importance as regards caulking and making a steam-tight joint. The series of tests concluded with two experiments, to ascertain the effect of arranging the plates to 'break joint' seven holes or 14 in. apart. The plates were ½ in. thick, the rivet holes for the chain riveted seams ¾ in. diameter and 2¼ in. pitch, those for the intervening single riveted lap joint $1\frac{1}{16}$ in. diameter and 2 in. pitch, all drilled. When tested both joints failed from fracture of plate at the rivet holes. In the one case the ratio of joint to solid plate was 74.3, and in the other 75.2 per cent., giving a mean of 74.7 per cent. It, therefore, appears that for steam boilers made of iron plates ½ in. thick to work at high pressure, the best proportioned and strongest joint is the butt joint 'chain riveted,' with rivet holes drilled ¾ in. diameter and 2¼ in. pitch, the strength of which may be approximately estimated at 75 per cent. of the tensile strength of the plate."

It is not too much to say that Mr. Longridge's views concerning chain riveting are totally opposed to those of most engineers, who hold that by far the strongest joint is produced by zigzagging the holes.

Lap Joints, Single Riveted.

No. of tests	Nominal thickness of plate in inches	Nominal diameter of rivets in inches	Pitch of rivets in inches	Mean ratio of joint to solid plate, percentage.	Remarks. Plates.	Rivet holes.	How joints failed.
2	7-16 *f*	13-16	2	38.9	Unannealed.	Punched.	Plate broken.
2	"	"	"	45.7	Annealed.	Do.	Do.
2	7-16	⅝	2⅛	39.1	Unannealed.	Drilled.	Rivets sheared.
2	"	"	"	39.7	Do.	Punched.	Do.
2	"	"	"	41.8	Annealed.	Do.	Do.
2	"	¾ *b*	2	40.1	Unannealed.	Do.	In one, plate broken in the other rivets sheared.
2	"	"	"	44.2	Annealed.	Do.	Rivets sheared.
2	"	"	"	41.6	Unannealed.	Drilled.	Do.
2	"	¾ *f*	"	47.1	Do.	Punched.	In one, part of plate broken and 2 rivets sheared; in the other, all rivets sheared and plate crack'd at rivet holes.
2	"	¾ *b*	"	60.1	Do., joint diagonal, angle of 45°.	Do.	In one, plate broken; in the other rivets sheared.
2	½	13-16	2	40.7	Unannealed.	Do.	Plate broken.
2	"	"	2⅛	43.9	Annealed.	Do.	Rivets sheared.
2	"	"	"	39.4	Unannealed.	Do.	Rivets sheared and plate crack'd
2	"	"	"	39.0	Do.	Drilled.	Rivets sheared.
2	¾	9-16	1½	50.6	Do.	Punched.	In one, rivets all shear'd and plate cracked at holes; in the other, half of the rivets sheared and half the plate broken
2	¾	⅝	1½	60.9	Unannealed, breaking joint 1 hole, or 1½ in.	Do.	Rivets all sheared
2	"	⅝	"	55.5	Unannealed, breaking joint 5 holes, or 7½ in.	Do.	Rivets of one seam sheared and adjoining plate torn.
2	"	"	"	56.2	Unannealed, breaking joint 9 holes, or 13½ in.	Do.	Do. do.
2	7-16	¾	2⅛	44.9	Unannealed, breaking joint 1 hole, or 2⅛ in.	Do.	Rivets all shear'd
2	"	"	"	48.3	Unannealed, breaking joint 6 holes, or 12¾ in.	Do.	Rivets of one seam sheared; all the other rivets partly sheared and solid pl'te slightly torn.
2	½	13-16	2	54.7	Unannealed, breaking joint 6 holes, or 12 in.	Do.	In one, plates torn and one rivet sheared; in the other, rivets of one seam sheared and the adjoining plate torn.

NOTE.—The dimensions marked *f* were *fully*, and those marked *b barely* the sizes given.

The results obtained by Mr. Kircaldy are apparently so anomalous that they will no doubt cause much discussion. Until we have the precise details of the methods adopted in testing, it is of course impossible to say what direction the discussion may take. For ourselves, we admit that we have no hesitation in accepting the figures as being conclusive as far as they go. The number of experiments made was very considerable; the dimensions of the plates varied through a considerable range, and it is worth notice that the thinner the plate the higher was the proportion which the strength of the joint bore to that of the solid iron. Again, it cannot be argued justly that the quality of the metal materially affected the question, for it has always been the rule in calculating the strength of boiler seams to assume that its relation to the strength of the solid plate is totally unaffected by the quality of the iron. We shall only add now that we believe it to be quite possible to make single riveted seams which will stand 56 per cent. of the breaking strain of the plate; and we do not insinuate that Fairbairn's experiments were carelessly conducted or improperly handled. But Fairbairn certainly did not possess the facilities for making very accurate experiments on the strength of materials which exist now-a-days; and there is reason to believe that a tendency to generalize from a limited range of inquiry has been too often manifested by engineers in past years. We do not assert that Mr. Longridge has completely disproved the soundness of Fairbairn's conclusions; but he has, we think, advanced facts which must make thoughtful men limit the application of those conclusions. If it is certain, as it appears to be, that in a long course of experiments, carried out with the utmost care, Mr. Longridge, Messrs. Galloway and Mr. Kircaldy working together were unable to obtain more than a single joint as strong as all such joints were previously supposed to be, it is hard to believe that boiler shells, and bridges and ships really possess that margin of safety which it is confidently asserted they have. They may be safe enough, but they are probably not so safe as they are assumed to be.

Lap Joints, Double Riveted.

No. of tests	Nominal thickness of plate in inches	Nominal diameter of rivets in inches	Pitch of rivets in inches	Mean ratio of joint to solid plate, percentage.	Remarks. Plates.	Rivet holes.	How joints failed.
2	7-16 *f*	13-16	2	54.5	Unannealed.	Punched, "Zigzag riveting."	Plate broken.
2	"	"	"	58.1	Annealed.	Do. do.	Do.
2	7-16	"	2⅛	59.7	Unannealed.	Do. do.	Do.
2	"	¾ *f*	2⅛	66 1	Do.	Do. do.	Do.
2	"	13-16	2¾	61.0	Do.	Do. do.	Do.
2	½	15-16	3	60.3	Do.	Do. do.	Do.
2	"	⅝	3	64.9	Do.	Drilled do.	Do.
2	7-16	⅝	2⅛	53.2	Do.	Punched do.	Rivets sheared and plates cracked at holes.
2	7-16	¾	2⅛	62.9	Do.	Do., "Chain riveting."	Plate broken.
2	½	13-16	2⅛	61.6	Do.	Do. do.	Do.

NOTE.—The dimensions marked *f* were *fully*, and those marked *b barely* the sizes given.

Butt Joints, Single Riveted.

No. of tests	Nominal thickness of plate in inches	Nominal diameter of rivets in inches	Pitch of rivets in inches	Mean ratio of joint to solid plate, per cent.	Remarks. Plates.	Rivet holes.	How joints failed.
2	7-16	13-16	2	56.5	Unannealed.	Punched.	Plate broken.
2	"	"	¾	2	54.4	Do.	Do.
2	"	"	"	"	58.5	Do.	Drilled.	Do.
2	"	"	"	"	57.9	Annealed.	Punched.	Do.
2	"	11-16	2⅛	55.1	Unannealed.	Drilled.	Do.
2	½	¾	2⅛	51.5	Do.	Do.	Do.
2	7-16	11-16	2⅛	66.1	Do., breaking joint, 12 in.	Do.	Do.
2	½	¾	2⅛	60.5	Do. do.	Do.	Do.

Butt Joints, Double Riveted.

No. of tests	Nominal thickness of plate in inches	Nominal diameter of rivets in inches	Pitch of rivets in inches	Mean ratio of joint to solid plate, percentage.	Remarks. Plates.	Rivet holes.	How joints failed.
2	7-16	13-16	2½	61.6	Unannealed.	Punched, "Zigzag riveting."	Plate broken.
2	"	"	2¾	64.8	Do.	Do. do.	Do.
2	½	15-16	3	67.0	Do.	Do. do.	Do.
2	7-16	⅝	2½	65.6	Do.	Do. do.	Do.
2	"	"	3	66.9	Do.	Do. do.	Do.
2	½	"	"	62.4	Do.	Do. do.	Do.
4	"	"	"	65.6	Do.	Drilled do.	In one, rivets sheared and plate cracked; in the others, plates broken.
2	½	⅝	3	69.2	Do., joint diagonal.	Do. do.	Plate broken.
2	"	¾	"	63.3	Do.	Do. do.	Do.
2	7-16	⅝	2½	67.2	Do.	Punched, "Chain riveting."	Do.
2	½	¾	2⅛	66 2	Do.	Drilled do.	Do.
2	"	"	"	74.7	Do., breaking joint 7 holes, or 14 in.	Do. do.	Do.

Proposals for Car Wheels.

Notice is given that sealed proposals will be received for the supply of cast-iron engine truck and car wheels required by the Grand Trunk Railway Company of Canada, at Brantford and Stratford during three years, commencing May 1, 1877. Specification and form of tender can be had on application to the General Storekeeper, Montreal. Tenders endorsed "Tender for cast-iron wheels," will be received by Joseph Hickson, General Manager, on or before Saturday, March 31, at Montreal.

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Editorial Announcements.

Passes.—*All persons connected with this paper are forbidden to ask for passes under any circumstances, and we will be thankful to have any act of the kind reported to this office.*

Addresses.—*Business letters should be addressed and drafts made payable to* THE RAILROAD GAZETTE. *Communications for the attention of the Editors should be addressed* EDITOR RAILROAD GAZETTE.

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

THE STRENGTH OF RIVETED JOINTS.

It has been suspected for a long time by persons who have investigated the strength of riveted joints that the ordinarily received data relating thereto can not be relied upon implicitly, and that for some reason, not clearly explained or understood, such joints often break at much less strains than calculation would indicate to be their ultimate strength. The basis on which the data employed in such calculations rested was the experiments of Fairbairn, which were in some respects very unsatisfactory. These showed that the strength of a single riveted joint was equal to about 56 per cent. of the solid plate, and a double-riveted joint from 70 to 72 per cent. Nevertheless joints failed at times when Fairbairn's deductions showed they ought not to fail, and boilers from time immemorial have blown up which apparently had no sufficient logical or mathematical reason to justify their conduct. Such an explosion took place in Blackburn in England in 1874 and excited a keen interest and led to hot disputes among engineers afterwards. In order to set some of these disputed points at rest, Mr. R. B. Longridge, engineer to the Steam Boiler Insurance Company, instituted a series of experiments on the strength of riveted joints, which have been carried out by the celebrated Mr. D. Kirkaldy, whose investigations of the strength of materials have now become so noted, and the results and accuracy of whose investigations will not be questioned.

The details of these experiments have not yet been fully made public, but in his last report to the Steam Boiler Insurance Company, Mr. Longridge gives some of the results of these experiments. These, in a condensed form, apparently, are published in a recent number of *The Engineer* (Feb. 23, 1877), and are reprinted on another page. The conclusions deduced therefrom may be briefly stated to be, that boiler seams are not nearly as strong as Mr. Fairbairn thought, and as many of us believed they were. In twenty-eight experiments with single-riveted lap joints the average of the strength of the riveted seams, compared with that of the plate, was only 42.2 per cent., the lowest being 38.9, and the highest 50.6 per cent. The average of twenty experiments with double-riveted lap joints was 60.2 per cent. of the solid plate, the highest being 66.1 and the lowest 53.2 per cent. The average of sixteen experiments with single-riveted butt joints was 57.5, the highest 66.1 and the lowest 51.5 per cent. With double-riveted butt joints the average of twenty experiments was 65, the highest 67.2 and the lowest 61.6 per cent.

Experiments were also made with "diagonal joints," that is, joints which instead of being at right angles with the sides of the test piece were placed inclined at an angle of 45 degrees. A single-riveted lap joint of this kind gave a strength of 60.1 per cent. of the solid plate, and a double-riveted butt joint of this kind a strength of 69.2 per cent. The strongest of all the joints was one which is described as a 'double-riveted butt joint, *breaking joint 7 holes or 14 in.*" What is meant thereby is not apparent, but this joint gave a strength of 74.7 per cent. of the solid plate.

The plates varied in thickness from ¼ to ½ in., and the rivets from ½ in. to ⅝ in. in diameter.

One noteworthy fact was developed by the experiments. Some of the plates in which the rivet holes were punched were annealed and others unannealed when tested. Whether the annealing was done after or before the rivet holes were punched is not stated, but the great increase in strength is very apparent all through. Thus in the first experiments given the strength of the seam of the plates which were not annealed was 38.9 per cent. of the solid plate, whereas those which were annealed gave a percentage of 45.7 of the solid plate. In these two cases the plates were broken, but, what is very singular, in those experiments in which the rivets were sheared the resistance of the latter seemed to be increased *by annealing the plates*, which is owing, probably, to the fact that the increased ductility due to the process of annealing permitted the rivets to "come to a bearing" more perfectly than was possible when the plates were less ductile.

None of the plates in which the holes were drilled were annealed, so that it is impossible to say whether their strength would have been increased by the same process. But whether the plates were annealed or not, in no case was the strength of a single-riveted joint as high as that given by Fairbairn, that is, 56 per cent. of the solid plate.

The Engineer in commenting upon these experiments says: "It is also worth notice that the strength of the joint appeared to be quite independent of the manner in which the joints were made, that is to say, punching gave just as good results as drilling." This inference does not, however, seem to be justified by the experiments, or at least by the report of them published. It has not been claimed, we believe, that the resistance of the rivets to shearing would be affected by drilling the holes, but only that the strength of the plates was diminished by punching. Some experiments we know have shown that the rivets were *more* liable to shear in drilled holes than in those which were punched, but this has usually been attributed to the fact that the edges of the plate around the rivet hole are left sharper by a drill than by a punch, and therefore the plates are more effective in shearing the rivet. On the other hand it has been claimed that a rivet will have more resistance to shearing in a drilled than in a punched hole, on account of better workmanship and consequently fitting the hole better. The advantage of drilling has been supposed to be that the plates were not injured in the process of drilling as they are in the process of punching. The advantage of drilling can therefore only be expected to be apparent in those experiments in which the plates are broken. There are only two sets of these in which the conditions—that is the thickness of plates, diameter of rivets and their pitch—were the same, and of which the plates were in one case drilled and in the other punched, and in which both the plates were broken. The second and third experiments with single-riveted butt joints were both made with $\frac{7}{16}$ in. unannealed plates and ¾ in. rivets spaced 2 in. apart, and in both the plates were broken. The strength of the joint made with *punched* holes was 54.4 per cent. of the solid plate, and that made with *drilled* holes was 58.5 per cent., the latter being nearly *eight per cent.* stronger than the former.

The sixth and seventh experiments with double-riveted butt joints and zigzag riveting were also made under conditions which make a fair comparison of the effect of drilling and punching possible. The plates were in both cases unannealed, ½ in. thick, fastened together with ⅝ rivets spaced 3 in. apart. The strength of the joints made with *punched* holes was 62.4 per cent. and that of those made with *drilled* holes was 65.0 per cent. of the solid plate. The former percentage was an average of two experiments, whereas the latter was an average of four. In this case the drilled holes increased the strength of the joints over *four* per cent. As stated above, no experiments were made with *annealed* plates with *drilled* holes. It would be interesting to know the effect of annealing on drilled plates, as it seems by no means certain that the advantage of annealing is confined to plates with punched holes.

In no case, however, did the strength of the double-riveted seams reach 70 per cent., excepting in that described as "breaking joint," the construction of which is not explained.

The superiority of "chain" over "zigzag" riveting, which is shown, is an unexpected result, although it is impossible without further knowledge of the details of the experiments to know its full significance. These have not yet been made public, but will be looked for by engineers with a great deal of interest, and to quote again from the writer in *The Engineer:* "If it is certain, as it appears to be, that in a long course of experiments, carried out with the utmost care, Mr. Longridge, Messrs. Galloway and Mr. Kirkaldy, working together, were unable to obtain more than a single joint as strong as all such joints were previously supposed to be, it is hard to believe that boiler shells, and bridges, and ships really possess that margin of safety which it is confidently asserted they have. They may be safe enough, but they are probably not so safe as they are assumed to be." The fact that the boilers blow up, the bridges fall down, and the ships sink, is conclusive that they are not "safe enough," or probably is so to these who go up or down with them.

REPORT OF THE BRITISH COMMISSION ON RAILROAD ACCIDENTS.

In 1874 the House of Lords requested the appointment of a Royal Commission "to inquire into the causes of accidents on railways and into the possibility of removing any such causes by further legislation." In compliance with this request the Queen appointed eight Commissioners, the Duke of Buckingham, the Earl of Aberdeen, the Earl of Belmore, Lord de la Warr, Sir W. R. Seymour Fitzgerald, Gen. J. L. A. Simmons, Mr. T. E. Harrison (President of the Institution of Civil Engineers), Mr. W. Galt and Mr. Ayrton. Mr. Harrison is the Engineer of one of the great English railroad companies, and Mr. Galt is known as a student of railroad affairs, having written much on the subject. We do not know as any of the others had any special knowledge of railroad business. The Commission took plenty of time for its investigation, and examined a great many expert witnesses, including railroad officers and employes; and it was for it that the great trial of power brakes was made some eighteen months ago. Its report was expected a year ago, and much fault has been found because of the delay. It was at last presented February 9, and has attracted general attention throughout Great Britain. Indeed, the most valuable literature on the administrative features of English railroads is contained in similar reports published among the "blue books" of the British Government – corresponding to our public documents. The value has not been chiefly in the reports proper, made usually by men of few special qualifications for the investigations committed to them, but to the vast body of evidence collected and published with the report, and upon which the latter is founded. This evidence comes from experts, and frequently contains the only printed record of the most eminent British railroad men on questions of railroad policy. A thousand or two of large pages of evidence sometimes accompanies such a report, always thoroughly indexed, so that any one fact or class of facts on which testimony was taken may be examined by itself. Among such documents may be counted the "Gauge Commissioners' Report" of 1846, which gives the whole current of British opinion at the time on the relative merits of the 4 ft. 8½ in. and the 7 ft. gauge, and resulted, we may say, in putting an end to extensions of the latter gauge; later was the Royal Commission Report on the general subject of railroads and their relations to the community, rates, etc., (1865), and in 1872 what is known as the "Amalgamations Committee Report." Besides the evidence of English railroad men, these documents contain considerable translations of foreign documents, which form almost the only English accounts of Continental railroad practice.

The full report of the Accidents Commission we have not yet seen. It is not a very long document, and its conclusions are presented in the following brief recommendations:

"We propose that discretionary powers should be conferred upon the Board of Trade for the following purposes, to be exercised by the department subject to review by a competent appellate tribunal:

"1. To enforce the extension of stations and sidings, wherever the accommodation provided for the traffic is so inadequate as to endanger safety.

"2. To enforce the adoption of the block and interlocking systems on all lines and portions of lines where the introduction of these improvements is necessary for the safety of the traffic.

"3. To restrict the speed of trains upon any line or section of a line which is in a condition to render a high rate of speed unsafe.

"4. To require companies to provide their passenger carriages with continuous footboard.

"5. To impose conditions upon companies in certain cases in sanctioning the opening of new lines.

"6. To require companies to provide footbridges or subways at stations, where the absence of such accommodation is proved to be a source of danger.

"7. To require a lodge to be maintained at public crossings for foot passengers wherever circumstances render it necessary for safety.

"We further recommend that railway companies shall be required by law, under adequate penalties, to supply all trains with sufficient brake power to stop them within 500 yards under all circumstances.

"In order to produce greater punctuality in the conduct of the traffic on railways, we recommend that additional facilities be afforded to the public for obtaining compensation when trains are late.

"We recommend that the 31 and 32 Vict., cap. 119, sec. 22, relating to intercommunication in trains, be amended in the manner we have indicated.

"And, finally, we recommend an extension of the civil liabili-

ty of railway companies for accidents to their servants, and of the criminal liability of persons in railway employment for acts of negligence endangering life.

"In framing these proposals we have confined ourselves to describing in general terms the statutory provisions we recommend, judging that the details necessary to give practical effect to them can best be settled by Parliament."

Heretofore the Board of Trade has had substantially authority to investigate and nothing more. From the above recommendations it seems that the Commissioners believe that this is not sufficient; having investigated and discovered certain defects, it would give it authority to command the removal of such defects; but in order to protect the companies against arbitrary authority on the part of the Board of Trade inspectors, the Commissioners would provide an entirely new tribunal, to which the companies may appeal from the decision of the inspectors, or rather of the Board of Trade, which acts through its inspectors. This "competent appellate tribunal" is the original feature of the report, and it alone, doubtless, makes its recommendations at all acceptable to the British railroad companies. It certainly would be dangerous to give to a man, or body of men, like the Board of Trade inspectors, officers of the army technical corps (engineers, artillery or ordnance, usually), final authority to decide what a company shall do, without taking evidence, or putting on record the grounds of their decision. But if the companies have the right of appeal to a court with technical as well as legal qualifications, then it will be necessary to prove in detail that the defects complained of by the Board of Trade really do exist, and that the remedies required by it will really remove such defects.

The final recommendation, as to extending the civil liability of the companies for accidents to employes, will doubtless be strongly opposed by the companies; but it has been demanded by the men with much earnestness and unanimity, and it is favored by the Commissioners probably as a measure of public policy. The complaints are that the companies neglect to provide those appliances which only tend to secure the safety of the employes at their work, because they do not have to pay for injuries to these employes as they do for those to passengers and the public; and unquestionably there is a good deal of truth in this. On the other hand, the companies will probably be better pleased than the men with the recommendation for extending the criminal liability of the employes for negligence.

Like most similar investigating bodies in England, this Commission is disinclined to extend Government authority over the details of railroad management; and as there has been some discussion of the subject in this country recently, the following quotations from the full report deserve the attention of Americans:

"Upon full consideration, we are not prepared to recommend any legislation authorizing such an interference with railways as would impair in any way the responsibility of the companies for injury or loss of life caused by accident on their lines. To impose on any public department the duty, and to intrust it with the necessary powers, to exercise a general control over the practical administration of railways would not, in our opinion, be either prudent or desirable. A Government authority placed in such a position would be exposed to the danger either of appearing indirectly to guarantee works, appliances and arrangements which might practically prove faulty or insufficient, or else of interfering with railway management to an extent which would soon alienate from it public sympathy and confidence, and thus destroy its moral influence, and with it its capacity for usefulness.

"Even the powers now exercised by the Board of Trade in respect of new lines of railway are not wholly free from these objections. Here, however, the practical evils are so slight and the benefits are so considerable and definite that we think the only question is whether these powers might not be still further increased. But once a railway is opened, the State now holds the company responsible to maintain it and work the traffic in a manner compatible with the public safety. The Government inspecting officers have powers of inspection, and their reports are exceedingly valuable; but to go further and clothe a Government department with unlimited powers to interfere in the interests of public safety with the detailed working of traffic upon railways must necessarily create a concurrent responsibility, and in whatever measure this responsibility be cast upon a Government board, the responsibility now resting upon railway companies will be diminished."

This is precisely the ground taken by the Royal Commission of 1865, and is in fact one of the standing principles of British railroad legislation, distinguishing it sharply from the policy of Continental countries. There are apparent exceptions to it, among which may be counted some of the recommendations of this report; but deviations from it are adopted cautiously and with limitations.

Whether the recommendations of the Commission will be embodied in legislation is by no means certain. The Commissioners were not unanimous, and the Government on that account may hesitate to bring in a bill embodying the suggestions of the report. The head of the Commission, the Duke of Buckingham, could not sign it, being in India. Mr. Harrison, though he signed the report, dissented from its recommendations concerning the extension of liability for injuries to employes and to that regarding the punctuality of trains. Mr. Galt signed the report, but submitted a separate report which is said to make more radical recommendations. Lord de la Warr also made a separate report, said to recommend more stringent provisions than those of the majority report. Mr. Ayrton, who took a prominent part in the investigations of the Commission, did not sign the report at all.

But the value of the Commission's work does not depend upon the embodiment of its recommendations in laws, nor even on the soundness of those recommendations, as its members themselves expressly recognize. They say that the smallness of the results of the previous investigations forbids their taking a very sanguine view of the practical effects of their labors, if judged solely by the number of definite proposals offered. "But," they say, "we believe that now, as on former occasions, the discussion of the question will prove beneficial to the public interests in other ways and on general grounds." And in this they are doubtless right. The very appointment of the Commission, before it had begun an investigation, stimulated inquiry among the railroad companies, which has already resulted in action, and in the creation of a public sentiment in England which has doubtless made the adoption of certain important (and quite costly) safety appliances only a question of time, whatever Parliament may do or may not do.

Railroad Earnings and Expenses in 1876.

We published some time ago our usual table of railroad earnings for December, and with it one of the earnings for 1876 of such roads as had then reported. The number, however, was too small to warrant the drawing of any general conclusion. We have chronicled from time to time since then the returns of such roads as have reported, and we now consolidate all the returns received to date for the year 1876. These are from 54 railroads, with a total of 26,292 miles of road, or about 35 per cent. of the total mileage worked that year in the United States. The list includes most of the Chicago roads, several St. Louis roads, several Southern roads, but of "Eastern trunk lines" only the Pennsylvania and its leased lines, and but few New England roads. Several of the lines, however, suffered by the trunk lines, competition, and the returns of the whole may be a tolerable indication of the general condition of the railroad business of the country for the year. Our returns show that the average earnings per mile of the roads reporting was $7,963 in 1876 against $7,604 in 1875. There is thus an increase in gross earnings of $359, or 4¾ per cent.

This would be quite satisfactory if the earnings of 1875 had not been unusually small. These were less than in 1874 on nearly 20,000 miles of road whose returns are tabulated in our issue of June 16 last by more than 7 per cent. But we are able to get at least this satisfaction from our returns, namely, that the downward progress in gross earnings which had continued from 1873 to 1875 seems to have been arrested at last in 1876.

Our table, however, gives still more interesting information of the results of the business of 1876 in the working expenses which it gives for about three-fourths of this mileage, viz., 19,483 miles in 1876, or about 26 per cent. of the whole mileage in the country. The average earnings, expenses and net earnings per mile of these roads were:

	1876.	1875.	Increase.	P. c.
Gross earnings	$7,898	$7,856	$42	0.54
Expenses	4,828	4,817	11	0.23
Net earnings	3,070	3,039	31	1.00

So far as earnings are concerned, doubtless the returns of the greater number of roads are most significant; but even those of the smaller number which report expenses also show, as we see, an increase in earnings per mile over 1875, though the increase is extremely small.

As for expenses, we may say there is no change. They were 61.32 per cent of the earnings in 1875 and 61.19 per cent. in 1876, and the increase in net earnings was 1 per cent., or $31 per mile of road. The net earnings of the roads reporting were equivalent last year to 7 per cent. on a capital of $43,857 per mile of road.

These figures indicate that the reductions in expenses, as well as of earnings, have about reached their limit. We know that in many cases reductions were effected last year; but the figures above show that on the whole the reductions in expenses were balanced by increases elsewhere, so that the net result was substantially the same as in 1875.

In 1875 we published a similar table for 1873 and 1874, covering 17,684 miles of road. The tables for the several years do not include the same roads, and we cannot conclude from them what the absolute amount of earnings and expenses have been in different years, either in gross or per mile of road. They do, however, show pretty fairly the direction and the rate of progress, both in earnings and expenses. This has been: In gross receipts per mile of road worked from 1873 to 1874 there was a decrease of 6.5 per cent.; from 1874 to 1875, a further decrease of 7.3 per cent., and from 1875 to 1876 an *increase* of 0.54 per cent. In working expenses there was a decrease of 13.7 per cent. from 1873 to 1874; a further decrease of 6.2 per cent. from 1874 to 1875; and an *increase* of 0.23 per cent. from 1875 to 1876. In *net earnings* there was an *increase* of 7.5 per cent. from 1873 to 1874; a decrease of 9.1 per cent. from 1874 to 1875; and an increase of 1 per cent. from 1875 to 1876. Let us illustrate this progress by an assumed case of a road of $10,000 gross earnings per mile, with the average progress since, premising that the proportions of working expenses for the four years beginning with 1873 have been 66.01, 60.93, 61.32 and 61.11 per cent. of the earnings, respectively.

	Gross earnings.	Expenses.	Net earnings.
1873	$10,000	$6,610	$3,390
1874	9,350	5,705	3,645
1875	8,767	5,352	3,415
1876	8,814	5,365	3,449

What is noticeable here is, that, notwithstanding the great decrease in receipts, amounting to nearly 12 per cent. since 1873 in spite of the trifling recovery of last year, the net earnings are absolutely larger than in 1873, and have been every year since that period. And if the railroad companies were not burdened with larger capital accounts than in 1873, apparently they would have nothing to complain of. But this is the heart of the trouble. The earnings of 1876 were made with a much costlier machinery than that of 1873. The improvements made in that year and even before, as well as those made later, in most cases first appeared as a charge to capital after 1873. And though doubtless much of this additional capital was needlessly spent, and most of it represents what could be obtained now for much less money, still the number of improvements not required by the traffic is not considerable. The chief waste of railroad capital has been in the construction of unnecessary new roads, not in the improvement of the useful old ones. These generally carry a larger traffic than formerly, in spite of the great depression of business, and very many could not possibly have carried the traffic of 1876 with the appliances of 1873.

And this suggests that the figures for expenses given above, and the largely reduced proportion of expenses to earnings by no means measure the whole extent of the economy effected in the cost of transportation. Out of the dollar earned 61 cents was paid for working expenses in 1876 against 66 cents in 1873. But the dollar was earned with much less work in the earlier year. The cost of doing a given amount of work, the true criterion of railroad economy, cannot be illustrated by such figures as those above, nor by any statistics for a great body of roads throughout the country. We can only cite the instances of individual roads and two or three States; such as the Atlantic & Great Western, which carried freight for 26 per cent. less last year than in 1873; the Pennsylvania, which shows a reduction of 32 per cent. in that time, and many other cases which we have referred to in reviewing annual reports.

Figures based like the above on little more than a quarter of the mileage of the country cannot, of course, be conclusive as to the condition of the railroad business of the whole country. They are, however, very strong indications of the general tendency of that business; and they point out that, so far as gross receipts are concerned, the downward movement culminated in 1875; and that working expenses, in spite of a greater volume of traffic, were as low as ever last year. Apparently, an improvement in business now, even at the rates of last year, will bring a corresponding increase of earnings, for there is no tendency to an increase of expenses observable; and a very slight increase in the rates received would result in a very considerable addition to net earnings.

The Chicago-Omaha Traffic.

The admission of three leading directors of the Union Pacific into the boards of the Chicago & Northwestern and the Chicago, Rock Island & Pacific companies has attracted a good deal of attention in New York and Chicago, and has caused a renewal of the old report that a combination will be made extending from Ogden at least to Chicago, and possibly to New York, the Canada Southern and the Erie with the incomplete Canada Southern & Chicago being usually spoken of as the Eastern section of the line. A great deal more attention is paid to this rumor than it deserves. If such a plan should be carried into effect (which is improbable), the results would be comparatively unimportant. As is customary with traffic extending over long distances, the amount of the traffic over the Pacific railroads is greatly exaggerated in the public estimation. It is really an important traffic, and to the Pacific railroads a profitable one; but it is positively small in amount, as is shown by the fact that it is accommodated by one through freight train and one passenger train daily. At Omaha this traffic is distributed between three routes to Chicago and two to St. Louis, the latter being further subdivided after reaching Omaha. Of course only a fraction of it goes farther east, and of this a considerable part is distributed before it reaches the sea-board, while not all that goes to the sea-board is consigned to New York. Of course it would be advantageous (when there is any profit on traffic) for any one route to get the Pacific business, however small, which now goes to its rivals, provided these rivals should not retaliate on other competitive traffic; but the whole business is not great enough to be a very serious matter. It is largest on the three pooled lines between Council Bluffs and Chicago. Should the Chicago, Burlington & Quincy be excluded from this pool and the entire Pacific business between Chicago and Council Bluffs be secured for the Northwestern and the Rock Island, then, to put it algebraically, the latter roads would each be benefited to the extent of one-sixth of the profits of one train-load of passengers and one of freight over the Union Pacific, minus the part going to and through St. Louis plus the part distributed west of Chicago plus the part originating at or destined to Omaha.

Evidently no company will be made rich or ruined by the gain or the loss on one-sixth of two train-loads daily over a distance of about 500 miles (and, as we have said, not all this traffic passes over the pool lines). At the average profit per train of last year, such an amount of traffic would bring in a net income of about $250 per day, or at most $80,000 per year.

But often the effect on the price of stocks of a merely possible change of traffic of this kind is altogether out of proportion to its actual importance. In the case of the three companies in the Omaha pool, the Northwestern and the Rock Island stocks are active, but the Burlington is not. The dealings in the latter have been almost exclusively by investors, and it is very difficult to make much by bearing such a stock, however successful may be a movement for bringing down the price. Thus a speculative movement based on the prospect of a diversion of traffic from the Burlington to the other two roads would seem to have more chances of profit from the bulling of Rock Island and Northwestern than from the bearing of Burlington stock. But the course of the market indicates that the fears of Burlington stockholders have been greater than the hopes of the holders of stock in the other two companies. Burlington stock, which has rarely been lower than 110 (fluctuating between 112⅛ and 121¼ in 1876) sold down to 94 March 19, having stood at 110 Feb. 28; but meanwhile Northwestern, both common and preferred, has fallen about two points, and Rock Island about one point. Meanwhile no intimation has been given by either of the three companies that any change is contemplated. The "street' is always ready enough to draw such conclusions for itself, and to act upon them as if they were actualities instead of possibilities. The three companies have found the advantage of their agreement concerning Omaha business such that they are hardly likely, one would suppose, to give it up.

The Winter Grain Movement.

The grain movement of the winter has not been heavy. For the first two months of the year the receipts of the Northwestern markets were the smallest for four years and 18⅛ per cent. less than last year, the shipments of the same ports for the same time being 28 per cent. less than in 1876, but 13⅛ per cent. greater than in 1875. The whole shipments for these nine weeks were not equal to two weeks' shipments frequently during the season of navigation. This, however, is not proof of inactivity in grain movement. For the same nine weeks the receipts at the seven Atlantic ports were nearly twice as great as the shipments of the eight great Northwestern markets, indicating that a large part of the receipts are of grain shipped through directly from the farmers' stations, and not reported at all at the great shipping centers in the West. The figures for the totals of grain of all kinds for this period, Jan. 1 to March 3, are:

	1877.	1876.	Decrease.	P. c.
Northwestern receipts...	17,777,976	21,865,168	4,087,192	18.2
" shipments.	8,465,159	11,812,500	3,347,341	28.4
Atlantic receipts.....	15,982,658	19,685,122	3,702,464	18.8

Notwithstanding the much lighter movement from the Northwestern markets, the stocks have been kept down there as much as last year, the excess of receipts over shipments for the nine weeks being 9,300,000 bushels this year against 10,000,000 last year.

The chief interest, however, is in the distribution of receipt at the Atlantic ports. It was the extraordinarily large proportion of receipts at Baltimore that formed the occasion for the disastrous railroad war of last year. New York and New York railroad companies had reason to fear that if the increase at Baltimore that year was the *beginning* of a movement, it would leave New York sadly behind long before it came to an end. To ascertain whether that diversion has continued this year, we compare the receipts at the different Atlantic ports for the first two months of the two years.

Receipts of Grain of all Kinds from Jan. 1 to March 3 at the Seven Atlantic Ports.

	1877. Bushels.	1877. P.c. of total.	1876. Bushels.	1876. P.c of total.
New York.....	4,401,502	27.5	5,832,075	31.0
Boston.....	2,535,063	15.8	1,415,245	7.5
Portland.....	318,629	2.0	373,300	2.0
Montreal.....	51,450	0.3	228,075	1.2
Philadelphia.....	2,675,000	16.7	4,138,325	22.0
Baltimore.....	5,203,544	32.5	5,441,575	29.0
New Orleans.....	827,099	5.2	1,375,113	7.3
Total*.....	16,012,887	100.0	18,803,608	100.0

* The totals reported by the Produce Exchange vary considerably from these, which are the footings of the weekly receipts.

Thus it appears that New York's proportion of the total has fallen by 3½ per cent. and Baltimore's has increased by precisely the same amount, this difference being not considerable, nor more than might ordinarily occur without exciting surprise or apprehension. Much more marked is the decrease of Philadelphia by 5.3 per cent. and the increase of Boston by 8.3 per cent.

Baltimore receipts have always been chiefly corn; and fluctuations in its business would be sufficiently accounted for by fluctuations in the movement of this grain differing from those of the total grain movement. The receipts of corn for the same nine weeks have been:

Receipts of Corn at Atlantic ports from Jan. 1 to March 3.

	1877. Bushels.	1877. P.c. of total.	1876. Bushels.	1876. P.c. of total.
New York.....	2,326,948	19.9	2,655,823	20.9
Boston.....	1,713,948	14.6	976,723	7.7
Portland.....	108,930	0.9	89,600	0.7
Montreal.....	2,000	....	3,400	....
Philadelphia.....	2,113,400	18.1	2,695,300	21.2
Baltimore.....	4,739,400	40.5	5,166,600	40.7
New Orleans.....	704,003	5.0	1,104,658	8.8
Total.....	11,708,629	100.0	12,692,104	100.0

Here we see that the changes have been slight, Baltimore's rank being almost the same as last year, New York's a little lower; Philadelphia's considerably lower, and Boston's much higher.

If we compare the proportions of receipts at Baltimore and Philadelphia together for the two months for both years, we shall see just how far the diversion which became so serious in 1876 has been extended or maintained in 1877. They were:

	All grains 1877.	All grains 1876.	Corn 1877.	Corn 1876.
Baltimore and Philadelphia.	49.2 p. c.	51.0 p. c.	58.6 p. c.	61.9 p. c.
New York.....	27.5 "	31.0 "	19.9 "	20.9 "

Thus we see that the Southern cities have not quite kept up to the position attained in 1876; though New York has not gained what little they have lost, but has also lost, most of the losses of all three going to Boston, as we have seen.

Really the winter grain movement is not important, so far as amount is concerned. Last year the receipts for the two months here reported were but little more than one-twelfth of the receipts of the whole year. But their importance to the railroads is greater than would appear from this; for, in the first place, they carry the whole of the traffic at this season, while in the season of navigation about one-half of it is moved half way at least by water; and, in the second place, the rates in winter are much higher than the summer rates. Indeed, it is not often that any appreciable profit can be made in carrying grain in the season of navigation against the competition of the lakes and canal.

Record of New Railroad Construction.

This number of the *Railroad Gazette* has information of the laying of track on new railroads as follows:

Seattle & Walla Walla.—The first track is laid from Seattle, Wash. Ter., south to Renton Coal Mine, 15 miles. It is of 3 ft. gauge.

THE NEW YORK RAILROAD COMMISSIONERS' BILL is receiving the support of a committee of the New York Cheap Transportation Association, which has waited upon the Assembly to urge its adoption, concerning which there appears to be considerable indifference in the Legislature. The bill provides for a board with powers and duties substantially the same as those of the Massachusetts Commission, which has certainly been a very useful body; that is, it would have powers to investigate and to recommend—would form a sort of public council to study railroad questions for the community and the Legislature, formulate public opinion, and direct it. The only direct effect which such a body would be likely to have at first would be in the supervision of the annual reports made to the State, which certainly need closer examination than they now get. But a New York railroad commission would probably soon be called upon to urge upon the companies (and perhaps to recommend to the Legislature) two policies concerning tariffs which are in their nature irreconcilable: one the maintenance of through tariffs so low as to prevent the diversion of business from the port of New York, and the other the equalization of through and local tariffs so that the profits on the latter may not greatly exceed those on the latter. The rates which would suit New York city would compel the rest of the State to pay the entire income on the capital invested in New York railroads; and the rates that would suit the interior (and which to many of the people there seem to be their due) would either deprive New York city of most of its export and import business, or would leave the trunk lines almost entirely without net earnings to pay interest on the capital invested in them. It is not probable that a New York Legislature will very soon be induced to tinker the railroad tariffs, perhaps; but it is asked to do so at nearly every session, and it would be a good thing if the question were once thoroughly discussed by capable men, and the discussion put on record. Of course it is by no means certain that the State would get capable men for Commissioners. The bill before the Legislature gives large salaries to these officers; and, as things go, such places are absorbed by those who are devoted to politics and not to special studies. A board including an Adams, a Chanute or a Fink would be one thing; one made up of New York aldermen or assemblymen would be quite another.

SLEEPING CAR CHARGES are frequently a subject of complaint to people who do not recognize in such cars any cause of increased expense different from that due to the costlier fittings. Recently a bill was introduced into the New York Legislature, limiting the charges for a seat in a drawing-room car, or a single berth in a sleeping car, to 35 cents for 100 miles, and at the rate of two mills for every additional mile. At this rate the charge from New York to Buffalo by the New York Central would be limited to $1.03, and from New York to Albany to 44 cents. Those who favor such a limitation do not consider how great an extra weight per passenger is required in these cars. For every seat in an ordinary first-class car, about 600 lbs. of car is hauled; for every seat in a drawing-room car, usually as much as 2,000 lbs. Now, to require a railroad to give a seat or a berth for 100 miles for 35 cents is equivalent to requiring it to haul 1,400 lbs. of weight at express speed for that price, which is equivalent to 700 lbs. of freight loaded on a freight car. But the boldest of those who find fault with sleeping and drawing-room car charges would not think of limiting the charge for freight in slow freight trains to 5 cents per 100 lbs. for 100 miles. The fact is, that there is nothing which a railroad gives so cheap in proportion to its cost as drawing-room and sleeping-car accommodations.

THE PROCEEDINGS OF THE ASHTABULA JURY, it has been announced by advertisements and otherwise in these columns, would be published in a volume soon, with many interesting engravings. J. M. Goodwin, C. E., who had intended to undertake the publication, now writes us that his list of subscribers for the projected work is so brief as to make it apparent that the publication of the book would entail upon him a considerable loss of money, and that in view of this fact he has relinquished the undertaking. It is unfortunate that greater support was not given to his plan; for a detailed record of the investigation would have had a permanent value.

Contributions.

Surveys First and Estimates Afterwards.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I notice in your last issue a letter from Mr. Wm. F. Shunk, criticising an expression in one of my recent papers which was certainly somewhat hurried and careless; viz., that the making of "surveys first and estimates afterwards" is a "vicious practice," and that "any one who ever had done it or ever would do it may rest assured that his alignment will not stand the slightest economic analysis." I fear it is now too late to correct or explain this ambiguous expression in the reprint of my articles. The fact that there could be any ambiguity about it did not occur to me; but the practice which I condemn is this: first making the final location—by guesswork; then fixing, or readjusting, the grades thereon—by guesswork also; and *then* proceeding to make an estimate of the *whole* line preparatory to construction, if indeed the last process be not altogether omitted.

I think Mr. Shunk will agree with me that this practice is very common and incurably vicious. That such a practice exists at all is simply an expression of the fact that a majority of our locating engineers and nearly all the officials at the head of our railways have really no idea that any careful analysis of a multitude of economic problems is necessary or advisable before proceeding with and during the progress of the "survey." A line or lines are run and one of them turned in as the "best that can be done," wholly oblivious of the fact that there are a thousand "bests," differing widely from each other in accordance with an infinity of varying conditions. In default of an attempt by some more capable writer, I have endeavored to point out and analyze these conditions, with what success it is not for me to say; but if I have attained absolute correctness and a locating engineer knew the book by heart, I do not believe his line would be *very greatly* benefited if he were to make his "surveys first and estimates afterward," and *neglect* a constant and continuous balance of both *cost and* value. For however fully he may have accepted correct views *in theory*, the nature of location is such that if he rely for their application upon that species of guess-work which is dignified by the name of judgment, he will almost inevitably be led astray by his eye-sight. That evil which he *sees* must plainly seem the greatest, as we may see upon multitudes of railways. The impulse of the natural man seems to be toward the following order of requirements: first easy curves, then low summits, and then a short line; and such grades as are *then* found practicable are turned in, in all good faith, as the "best that can be done." Now this is the reverse of sound practice, and no man, in my judgment, ever does or ever will deviate from it as far as he *ought to* unless his alignment be determined at every step, both in general and in detail, by a constant reference to the hard-pan of dollars and cents. This course alone will deeply and *practically* impress upon the mind the fundamental truth, which lies at the basis of all correct or even respectable location, that the height of summits matters little, and the length of line matters less, and the amount of curvature doesn't matter at all; but that *the lowest attainable grades for the longest distances possible, and all other grades so adjusted that the power of any additional engines may be fully exerted during a short run and stored up in the train* is the first, last and only desideratum for a good and economical line. This great truth, of course, is not to be taken neat. It should be diluted if necessary "to such consistency that any old woman in the land can take it with perfect impunity"; but it is too often defied and neglected wholly, with a most unfortunate effect on the cost of construction, often as much as 100 or 200 per cent. Not on this account, however, do I lay such stress upon it, but on account of the truly appalling effect which it often has upon operating expenses. How great this is is but little appreciated. It is but speaking forth the words of truth and soberness to say that there are on this continent, not hundreds nor thousands, but tens of thousands of miles of railway which would be dear at the price if they had been constructed to sub-grade for nothing. *Bad design, badly selected route and grades*, is the most crying evil in the transportation problem of to-day, as any one will find who will look into the subject; and I do not believe it will ever be fully corrected except by that constant and careful analysis of every possibility on which I have insisted. To stake out some manner of railway over which a locomotive may be run is a very simple matter, and careful accompanying estimates are wholly superfluous, for that kind of work is no more engineering than staking out town-lots; but to obtain the maximum of economy at the minimum of cost; to turn topographical obstacles *to advantage*, and make them bring grist to the stockholders; this is not easy, but one of the most involved and difficult problems of engineering pure and simple. Nevertheless, this end is almost always attainable, and if it is to be reached it is, in my judgment, absolutely essential that, after the first rude examinations have been made, careful and continuous estimates of *cost and* value should precede and accompany every part of the subsequent work. It is a pity that location surveys could not be made for a time with the chain alone, as they might quite as well be, until engineers have more generally learned that the accuracy of the stake-setting is nothing and the economic problem is everything.

With this explanation of my meaning, I think Mr. Shunk will agree with me that the making of "surveys first and estimates afterwards" is an essentially "vicious practice."

The same issue of your paper contains a second attack upon my discussion of the Cincinnati Southern alignment, but one of such character that it would be profitless to analyze it temperately, and I fear I could never compete with the gentleman in the hurling of ebullition. The estimates upon which I based my comparative analysis were those given in the official "Report on the Progress of Work" by Thomas D. Lovett, Principal and Consulting Engineer, bearing date of Nov. 1, 1875. If, as the gentleman states, the cost of the Cincinnati Southern Railway, or any part thereof, has been in fact increased some 50 per cent. over so recent an estimate, that fact has no bearing upon a comparison of another line therewith, in which the cost of the latter was explicitly deduced from the estimated cost of the former as a premise, and it is unfair to increase the cost of the present line only, which constituted my premise, by that percentage, and in that

way seek to prove that I have made excessive reductions from quantities which I never had, and could not have had, before me. This fact is so self-evident that, with all due respect to the gentleman, it is impossible to place any confidence in the arguments or sincerity of any one who could fail to perceive it without being twice told of it; and as he makes up for any deficiencies in this respect by the vigor of his personalities, and as his controversy, furthermore, is confessedly restricted to two trivial side-issues, I leave to him an undisputed field.

ARTHUR M. WELLINGTON.

DANVILLE, Pa., March 19, 1877.

General Railroad News.

ELECTIONS AND APPOINTMENTS.

Gulf, Colorado & Santa Fe.—Mr. George B. Nichols has been appointed Superintendent. He was formerly for a long time Superintendent of the Galveston, Houston & Henderson, and also at one time ot the Galveston, Harrisburg & San Antonio road.

New Hampshire Railroad Commissioner.—At the recent election in New Hampshire, Dr. Granville P. Conn, of Concord, was chosen Railroad Commissioner.

Cincinnati, Hamilton & Dayton.—Mr. R. M. Shoemaker has been chosen President, in place of F. H. Short, resigned.

Beef River Valley.—This company was recently organized by the election of the following directors: Wm. Fisher, Harvey Brown, James T. Brownlee, H. K. Fisher, J. Dillon, Henry Adams, Mondovi, Wis.; George B. King, Eau Claire, Wis. The board elected Wm. Fisher President; Harvey Brown, Vice-President and Treasurer; James T. Brownlee, Secretary. The company's office is at Mondovi, Buffalo County, Wisconsin.

Quincy, Missouri & Pacific.—At the annual meeting in West Quincy, Mo., March 14, the following directors were chosen: Henry Root, C. H. Bull, A. Green, T. Redmond, C. M. Pomeroy, D. Paulin, George Bond, J. M. de France, E. M. Miller, John Wheeler, J. T. Sawyer, George Adams, E. V. Wilson. There was a dispute about Mr. Wilson's election, one party claiming that T. Jasper was chosen in his place.

Chicago, Decatur & St. Louis.—At the annual meeting in Chicago, March 13, the following directors were chosen: J. K. Barry, John L. Beveridge, W. L. Brown, Harvey W. Miller, Fawcitt Plumb, Samuel B. Raymond, Wm. Reddick.

Wyandotte, Kansas City & Northwestern.—At the annual meeting in Independence, Mo., March 6, the following directors were chosen: Peter Adams, Walter Buckner, James H. Roberts, Preston Roberts, James Scammon, Daniel Willets, Joseph Willets. The board elected Preston Roberts President; Peter Adams, Vice-President; Daniel Willets, Treasurer; E. C. Roberts, Secretary; G. W. Vaughan, Superintendent; James Scammon, Attorney.

St. Louis, Salem & Little Rock.—At the annual meeting in Steelville, Mo., March 6, the following directors were chosen: J. M. Orchard, Salem, Mo.; H. A. Crawford, St. Louis; W. L. Scott, J. McCarter, Erie, Pa.; A. L. Crawford, New Castle, Pa. The board re-elected A. L. Crawford President; Wm. Brewster, of Erie, Pa., Secretary and Treasurer; E. L. Foote, of St. Louis, Assistant Secretary and Treasurer; J. W. Blanchard, Superintendent; E. B. Sankey, General Freight Agent; H. A. Crawford, Purchasing Agent.

Paducah & Elizabethtown.—The board of directors of this company, organized by the bondholders who bought the Main Line of the Louisville, Paducah & Southwestern, is as follows: Wm. B. Bona, B. Dupont, Julius Hallgarten, Arnold Marcus, R. H. G. Minty, Extine Norton, W. F. Norton, Henry C. Pindell, H. W. Smithers. Mr. H. W. Smithers is President and Gen. R. H. G. Minty, General Manager.

Cleveland, Tuscarawas Valley & Wheeling.—At the annual meeting in Cleveland, O., March 14, the following directors were chosen: Selah Chamberlain, Amasa Stone, H. Cooke, E. B. Thomas, Cleveland, O.; C. Russell, Massillon, O.; W. W. Holloway, G. P. Rhodes, Bridgeport, O.; H. G. Brooks, Dunkirk, N. Y.; H. H. Kent, New York. Messrs. Holloway and Rhodes are new directors, the board having been increased from seven to nine members.

Western Union Telegragh.—The board has elected Cambridge Livingston and Samuel F. Barger directors in place of Cornelius Vanderbilt and W. R. Vermilye, both deceased; and Wm. H. Vanderbilt a member of the Executive Committee, in place of Cornelius Vanderbilt.

Southwestern, of Canada.—At the annual meeting in Windsor, Ont., March 10, the following directors were chosen: George A. Brady, George Campbell, R. E. Johnson, Daniel McGregor, Thomas Sutton.

Southern Minnesota.—A corrected list of the officers of the new company organized by the purchasing bondholders is as follows: President, Cornelius B. Gold, New York; Vice-President and Secretary, P. M. Myers, New York; General Manager, W. C. Van Horne, La Crosse, Wis.

Chicago, Quincy & St. Louis.—The first board of directors of this new company is as follows: Henry Root, Wm. Charles, Quincy, Ill.; A. A. Glenn, Mt. Sterling, Ill.; H. T. Foster, F. Erhardt, Beardstown, Ill.; J. A. M. Cope, J. M. Walker, London, England. The officers are: Wm. Charles, President; Henry Root, Secretary and Treasurer.

Grand Rapids & Indiana.—The new board has elected W. O. Hughart, President and General Manager; W. R. Shelby, Vice-President and Treasurer; I. H. P. Hughart, Secretary. Mr. Shelby, heretofore Secretary and Treasurer, becomes Vice-President; he is succeeded as Secretary by Mr. I. H. P. Hughart.

Cumberland & Piedmont.—Mr. James A. Milholland has been appointed General Manager, with office at Cumberland, Md.

New York State Superintendent of Public Works.—The Governor of New York has appointed Gen. George B. McClellan to this position, which is a new one, the incumbent having the management and charge of the State canals. General McClellan's chief experience in administration since the war has been as Chief Engineer of the Department of Docks of the city of New York, President of the Atlantic & Great Western Railroad Company, and President of the United States Rolling Stock Company. The nomination was, however, subsequently rejected by the Senate.

Western North Carolina.—The stockholders have elected directors as follows: J. S. Henderson, of Rowan County; J. W. Wilson, of Burke County; J. S. Brown, of McDowell County. The other nine directors are appointed by the State.

PERSONAL.

— Col. David E. Potts, for 30 years and until recently Treasurer of the Petersburg Railroad Company, has been appointed Postmaster at Petersburg, Va.

— The Cincinnati *Enquirer* says that Mr. B. E. Smith, President of the Columbus, Chicago & Indiana Central and the Columbus & Hocking Valley companies, has received a contract to build a railroad in South America, and will organize a corps of engineers and leave for that country this month. Quite a number of engineers that have been engaged in building the Columbus & Toledo Railroad have secured positions, and will go.

— Judge Thomas A. Walker has resigned his position as one of the Receivers of the Selma, Rome & Dalton Railroad.

— It is reported that Mr. A. L. Hopkins, now General Manager of the Wabash Railway, has asked to be relieved from his position as Receiver of the Toledo, Peoria & Warsaw.

— Col. W. A. Eliason, formerly Chief Engineer of the Western North Carolina road, has been appointed Postmaster at Statesville, N. C.

TRAFFIC AND EARNINGS.

Railroad Earnings.

Earnings for various periods are reported as follows:

Year ending Dec. 31:

	1876.	1875.	Inc. or Dec.	P. c.
Grand Rapids & Indiana	$1,137,540	$1,143,742	Dec.	$6,202	0.5
Expenses	821,032	876,633	Dec.	55,601	6.3
Net earnings	$316,508	$267,109	Inc.	$49,399	18.5
Earnings per mile.	3,426	3,445	Dec.	19	0.5
Per cent. of exps.	72.18	76.65	Dec.	4.37	5.7
Maine Central	1,726,501	1,786,076	Dec.	59,575	3.3
Expenses	1,042,000	1,147,067	Dec.	105,067	9.2
Net earnings	$684,501	$639,009	Inc.	$45,492	7.1
Earnings per mile.	4,863	5,031	Dec.	168	3.3
Per cent. of exps.	60.35	64.22	Dec.	3.87	6.0

Two months ending Feb. 28:

	1877.	1876.			
Cairo & St. Louis	$40,277	$40,663	Dec.	$386	0.9
Cleveland, Mt. Vernon & Delaware	51,670	57,867	Dec.	6,197	10.7
St. Joseph & Denver City	59,998	55,019	Inc.	4,979	9.1
St. Louis, Kan. City & Northern	240,042	246,099	Dec.	6,057	2.5

Month of January:

Hannibal & St. Joseph	$122,796	$142,968	Dec.	$20,172	14.1

Month of February:

Cairo & St. Louis	$22,075	$18,872	Inc.	$3,203	16.9
Cleveland, Mt. Vernon & Delaware	25,246	28,819	Dec.	3,573	12.4
St. Joseph & Denver City	31,718	28,196	Inc.	3,522	12.5

First week in March:

Denver & Rio Grande	$10,454	.....	.....	.....	....

Week ending March 9:

Great Western, of Canada	$67,879	$78,538	Dec.	$10,659	13.6

Week ending March 10:

Grand Trunk	$160,820	$200,496	Dec.	$39,676	19.8

Grain Movement.

San Francisco exports for February were 30,900 barrels of flour and 1,348,600 bushels of wheat. For the eight months of the California crop year from July 1 to Feb. 28 the shipments were 371,500 barrels of flour and 15,979,000 bushels of wheat. The surplus still remaining for export from last year's crop is estimated at about 2,500,000 bushels.

Coal Movement.

Coal tonnages for the week ending March 10 are reported as follows:

	1877.	1876.	Inc. or Dec.	P. c.
Anthracite	318,390	62,853	Inc.	255,537	406.6
Semi-bituminous	28,113	49,689	Dec.	21,576	43.4

Pennsylvania bituminous and semi-bituminous coal tonnages not previously reported for the two months ending Feb. 28 were:

	1877.	1876.	Inc. or Dec.	P. c.
East Broad Top R. R.	25,956	11,985	Inc.	13,971	116.4
Bellefonte & Snow Shoe	9,455	8,875	Inc.	580	6.5
Allegheny Region	31,030	31,089	Dec.	59	0.2
Penn and Westmoreland gas coal	161,858	110,762	Inc.	41,096	37.1
Pittsburgh Region, rail	107,302	99,635	Inc.	7,667	7.7

The coal tonnage of the Pennsylvania Railroad for January and February was as follows:

	1877.	1876.	Increase.	P. c.
Anthracite	101,039	65,141	35,898	5.5
Semi-bituminous	243,225	168,106	75,119	44.7
Bituminous	290,190	241,486	48,704	30.2
Coke	162,839	119,131	43,708	36.7
Total	797,293	593,864	203,429	34.3

The Pennsylvania Coal Company sold 250,000 tons of coal at auction in New York, March 20, for delivery in April and May. The prices were $2.70 for lump and steamboat; $2.75 for grate and egg; $3.17½ for stove; $3 for nut, and $2.35 for pea coal, being from 10 to 15 cents per ton below last month. The Philadelphia & Reading has reduced its freight charges on coal to the lowest point ever reached, the new through rate being 90 cents per ton from Schuylkill Haven to Port Richmond, which is about one cent per ton per mile.

The representatives of the anthracite companies were to meet in New York, March 21, to consider the present condition of the trade.

There has been almost a total suspension of work in the Cumberland Region, but on March 17 meetings were held at Frostburg and Lonaconing and the miners voted to go to work at the price offered by the companies, 50 cents per ton. Work was therefore partially resumed this week, but it is thought that the trade will not be active until the Chesapeake & Ohio Canal opens. The reduction in wages will enable the companies better to meet competition. This is very active just now; among other items the Boston & Maine Company, which has heretofore used Cumberland, has contracted for a year's supply —35,000 tons—of Clearfield coal.

THE SCRAP HEAP.

Railroad Manufactures.

The Vulcan Iron Works, of St. Louis, have sold 4,000 tons of 56-lb. steel rails to the St. Louis & San Francisco Co.

The Starr Manufacturing Co., of Halifax, Nova Scotia, is building some iron bridges for the Intercolonial Railway.

Evans, Clifton & Co., who own and run a rolling mill in Cincinnati, have filed a petition in bankruptcy. Their statement makes their liabilities $115,000 and the assets $202,000, most of the assets being real estate and machinery.

The rolling mills of the Baltimore & Ohio Railroad Company, at Cumberland, Md., were started up last week, to run for some time.

Out of 51 blast furnaces in the Lehigh Valley 20 are now in blast and 31 idle.

The Vulcan Iron Works, at Chattanooga, Tenn., are to start up soon, making light rails, rail-joints, bolts and bar iron, and a nail mill is to be added to the works.

The Ramapo Wheel & Foundry Co. has received the report of the Centennial Commission, the award to the Ramapo Co. being for "Excellence of material and process of manufacturing, and resulting durability."

The Erie (Pa.) Rolling Mill has been sold to Wm. Brewster for $33,000.

The Van Horn Steam Heating Co., at New Haven, Conn., has begun the manufacture of a new apparatus for heating railroad cars by steam.

The Tennessee Iron & Steel Co., at Chattanooga, Tenn., is preparing to make seven tons of merchant bar per day.

The Wason Car & Foundry Co., at Chattanooga, Tenn., is doing little in the car shop, but has plenty of car-wheel and other work in the foundry.

The Wood & Light Machine Co., at Worcester, Mass., recently sold a large wheel lathe to a Connecticut railroad.

The Susquehanna Iron Co., at Columbia, Pa., is running its rolling mill full double turn.

The Globe Rolling Mill at Cincinnati is running with about two-thirds of a full force, principally on bar and boiler plate iron.

The Wason Company, at Springfield, Mass., is just finishing five first-class coaches for the Boston & Providence road. The interior finish of these cars has little or no gilding about it, the principal wood used being mahogany relieved by raised panels of bird's-eye maple. The company has also nearly completed two drawing-room cars for the Galveston, Harrisburg & San Antonio road, which have an open observation room, 12 feet long, at one end. A contract has been taken to fit up all the passenger equipment of the Providence & Worcester road with the Miller platform.

The Iron Clad Paint Co., of Cleveland, O., have lately made large shipments to the New Orleans & Mobile, the Mobile & Ohio, the Missouri Pacific, the Wabash, the Lake Shore & Michigan Southern, the Pennsylvania and the Virginia Midland roads; also to the Ontario Car Co., of London, Ont., and to the Baltimore Bridge Co., which is using this paint on the Kentucky River bridge.

Rochester Car Wheel Works.

A company has been organized for the purpose of building a car wheel foundry in Rochester, N. Y., and will very soon begin business. The works are to have a capacity of 70 wheels per day and are to be fitted up in the best manner, with the intention of making a thoroughly good wheel. Salisbury pig iron is to be used. The officers of the company are: C. H. Chapin, President and Treasurer; Hon. Wm. H. Barnum, Vice-President; W. K. Chapin, Secretary. Mr. James Campbell is to have immediate charge of the foundry. Mr. Barnum is already well known as an extensive iron manufacturer; Mr. Chapin is a banker of Rochester, but was formerly in the car-wheel business.

Wagon vs. Rail in Mail Service.

A Washington dispatch says: "The Post Office Department has issued orders for the establishment of a fast wagon service to carry the mails between Philadelphia and Lamokin Junction, destined for or coming from points on the Baltimore Central Railroad, between Lamokin, Pennsylvania, and Port Deposit, Maryland. This extraordinary conveyance of mails by express wagons, over a distance of 14 miles, along the side of a railroad, is ordered by Second Assistant Postmaster General Brady, in preference to yielding to the demands of the Philadelphia, Wilmington & Baltimore Railroad Company for special compensation for the service over this portion of the road, in addition to the amount now paid by the department for the general service over the whole of the direct line between Philadelphia and Baltimore. The amount of this particular claim for lap-service is not large, but General Brady is strongly disinclined to yield the point in the controvery, as the underlying question involves several hundred thousand dollars in the aggregate of similar cases throughout the country."

Missouri, Kansas & Texas Locomotive Report.

The Machinery Department reports as follows for the month of January:

	Passenger.	Freight.
Mileage of train engines	62,525	105,743
Mileage of loaded cars	280,211	1,496,461
Cost per train mile, revenue	18.66 cts.	23.19 cts.
" " " switching	0.83 "	1.68 "
" " " construction	0.78 "	0.91 "
Cost per car per mile, revenue	4.16 "	1.55 "
" " " switching	0.19 "	0.12 "
" " " construction	0 17 "	0.07 "
Cost of car repairs per train mile	10.48 "	7.37 "
" " " per car mile	2.34 "	0.53 "
" Pullman car repairs per mile	2.37 "	.....
Average loaded cars per train	4.48	14.02
Pounds of coal used per car per mile	13.30	6.40

The total expense of the Machinery Department was $54,-622.77; coal is charged at $2.23½ per ton. No allowance for switching is made to train engines; switching and work-train engines are allowed six miles per hour. There were 56 engines in revenue service, 11 in switching and 3 in construction service, and 8 in shop under repairs. The cost of switching and work-train engines is charged one-third to passenger and two-thirds to freight. Three empty freight cars are rated as two loaded ones.

OLD AND NEW ROADS.

New Jersey Railroad Legislation.

Among the laws passed by the New Jersey Legislature at its recent session was one making the wages of employes of corporations a prior lien upon the earnings of a road; this was intended specially to meet the case of the New Jersey Central. Another law passed making it a misdemeanor punishable by fine or imprisonment for railroad employes to abandon their trains on the road, or to interfere with other employes or endeavor to prevent them from working. A special law made it an offence punishable with fine and imprisonment to steal railroad tickets.

The provisions of the general railroad law allowing companies to consolidate were extended so as to include all railroad corporations of the State; heretofore they applied only to companies organized under the law.

Missouri, Kansas & Texas.

Two lines have been surveyed for the proposed extension from Denison, Tex., south to Sherman. The last line is west of the Houston & Texas Central line between the two towns.

The shipments of Texas live-stock over the road for the last two years are reported as follows:

	1876.	1875.	Increase.	P. c.
Cattle	82,114	49,138	32,976	67.1
Hogs	81,113	16,784	64,329	383.3
Sheep	10,722	3,466	7,256	209.3
Horses and mules	860	434	426	98.2

Business thus far in the present year is reported as very good.

North Pennsylvania.

Notice is given that the chattel mortgage bonds falling due April 1 will be paid on and after that date at the company's office in Philadelphia. Interest on them will cease from April 1. The amount of these bonds is $360,000.

St. John, Lake Eustis & Gulf.

This road is now graded from Lake George, Fla. (on the St. John River), south by west to Lake Eustis, 24 miles, and the company is trying to make arrangements for the iron. The trustees of the Florida Internal Improvement Fund have agreed to sell the company 90,000 acres of State lands at a nominal price, and it is expected that a considerable amount can be realized in this way. The population on the line and near the Lake Eustis terminus is extremely light.

Jacksonville, Pensacola & Mobile.

The Western North Carolina Company, Western Division, has filed a bill in chancery to recover $1,000,000 of its funds, which, it is alleged, were used in the purchase of the old Pensacola & Georgia and the Tallahassee railroads by M. S. Littlefield and J. Swepson, at one time officers of the Western North

RAILROAD EARNINGS AND NET EARNINGS, YEAR 1876.

Name of Road.	Mileage.		Gross earnings.		Per cent. of expenses.		Net earnings.		Gross ear'gs per mile.		Net earnings per mile.	
	1876.	1875.	1876.	1875.	1876.	1875.	1876.	1875.	1876.	1875.	1876.	1875.
			$	$			$	$	$	$	$	$
Atchison, Topeka 'k Santa Fe	697	548	2,486,583	1,520,358	47.27	45.96	1,311,094	821,608	3,568	2,774	1,881	1,499
Atlantic & Great Western	505	552	3,546,300	4,106,014	79.78	77.38	716,999	929,277	7,022	7,442	1,420	1,683
Atlantic & Gulf	350	346	959,378	965,870	63.31	66 15	352,913	326,928	2,741	2,791	1,008	945
Burlington, Cedar Rapids & Northern	401	401	1,128,071	1,311,377	77.11	64.55	258,226	465,091	2,814	3,270	644	1,160
California Pacific	113	113	1,296,522	902,330	82.29	50.82	229,550	445,858	11,475	7,984	2,032	3,946
Camden & Atlantic	67	67	564,951	548,493	52.73	63.14	266,973	207,642	8,431	8,186	3,985	3,099
Central, of Iowa	204	189	717,526	728,760	74.92	74.74	182,975	169,472	3,517	3,856	897	896
Chicago & Alton	678	650	4,960,529	4,656,764	54.25	55.92	2,269,468	2,052,638	7,318	7,164	3,348	3,158
Chicago, Burlington & Quincy	1,339	1,297	12,003,950	11,736,488	56.78	55.50	5,187,951	5,219,844	8,969	9,258	3,880	4,117
Chicago, Milwaukee & St. Paul	1,400	1,396	8,054,171	8,355,743	61.50	62.63	3,100,847	3,085,390	5,753	5,901	2,216	2,205
Cleveland, Columbus, Cin. & Indianapolis	471	471	3,676,458	3,774,217	80.88	76.58	702,918	884,114	7,797	8,005	1,492	1,877
Cleveland, Mt. Vernon & Delaware	157	157	373,593	426,027	82.99	79.42	63,533	87,666	2,380	2,714	405	558
Cleveland, Tuscarawas Valley & Wheeling	101	101	404,218	414,761	68.77	53.00	126,250	194,920	4,002	4,101	1,250	1,927
Detroit & Milwaukee	189	189	977,455	902,647	90.55	96.21	92,289	34,186	5,172	4,776	488	181
Flint & Pere Marquette	284	284	1,000,368	1,055,054	63.40	66.01	366,074	358,598	3,522	3,715	1,289	1,263
Galveston, Houston & Henderson	50	50	581,772	554,417	46.81	60.93	309,417	216,628	11,635	11,088	6,188	4,333
Grand Rapids & Indiana	332	332	1,137,540	1,143,742	72.18	76.65	316,508	267,109	3,426	3,445	953	805
Houston & Texas Central	505	505	3,162,519	2,980,053	59 50	61.22	1,277,322	1,143,936	6,262	5,901	2,529	2,265
Illinois Central	1,109	1,109	7,090,689	7,841,782	54.23	50.87	3,245,047	3,852,335	6,401	7,079	2,930	3,478
Indianapolis, Cincinnati & Lafayette	185	179	1,461,259	1,692,148	52.09	61.24	700,011	655,920	7,899	9,453	3,784	3,664
International & Great Northern	471	459	1,440,881	1,365,634	57.87	54.96	607,519	614,917	3,059	2,975	1,290	1,336
Kansas Pacific	673	673	3,000,799	3,363,760	57.34	53.55	1,280,469	1,572,880	4,459	4,998	1,903	2,337
Knox & Lincoln	49	49	134,556	146,214	53.74	49.38	62,221	74,016	2,746	2,984	1,270	1,511
Louisville, Cincinnati & Lexington	221	221	1,130,535	1,116,906	70.55	72.51	332,979	307,091	3,120	5,058	1,508	1,391
Maine Central	355	355	1,726,501	1,786,076	60.35	64.22	684,501	639,009	4,863	5,031	1,928	1,800
Marietta & Cincinnati	314	314	1,637,062	1,562,015	78.91	77.65	345,181	371,424	5,214	5,293	1,091	1,183
Nashville, Chattanooga & St. Louis	341	341	1,697,917	1,638,771	62 25	63.18	639,611	603,294	4,979	4,806	1,875	1,769
Northern Central	326	326	4,369,926	4,926,248	69.48	68 25	1,333,440	1,564,124	13,405	15,111	4,090	4,798
Paducah & Memphis	115	115	207,472	199,210	68.41	66.14	65,517	67,587	1,804	1,732	570	588
Pennsylvania and leased lines	1,624	1,566	36,891,061	34,464,104	59.86	61.21	14,809,832	13,369,643	22,716	22,008	9,119	8,537
Penn. Co.'s leased and controlled lines	2,857	2,857	23,210,320	23,716,625	70.18	67.32	6,920,545	7,750,608	8,124	8,301	2,422	2,713
St. Croix & Penobscot	22	22	40,107	55,112	53.12	64.18	18,856	19,743	1,823	2,506	857	897
St. Louis, Iron Mountain & Southern	685	685	4,002,045	3,802,941	50.87	53.00	1,966,325	1,789,087	5,847	5,552	2,871	2,612
St. Louis, Kansas City & Northern	504	504	3,143,866	2,643,833	61.53	79.83	1,209,339	533,280	6,238	5,246	2,399	1,058
St. Louis & Southeastern	355	355	1,103,219	1,006,649	78.03	85.55	242,571	145,468	3,108	2,836	683	410
St. Paul & Sioux City	122	122	573,758	560 014	61.30	68.60	222,080	175,944	4,703	4,590	1,820	1,442
Sioux City & St. Paul	148	148	357,893	317,464	67.50	76.10	116,156	75,747	2,418	2,144	785	512
Union Pacific	1,036	1,036	12,886,859	11,993,832	40.88	41.54	7,618,648	7,011,784	12,445	11,583	7,357	6,771
West Jersey	128	128	731,031	659,798	63.98	55.55	267,636	293,288	5,711	5,148	2,091	2,293
Totals	19,483	19,215	153,869,520	150,946,251	61.12	61.31	59,821,891	58,398,094	7,898	7,856	3,070	3,039
GROSS EARNINGS ONLY.												
Cairo & St. Louis	146	139	263,068	282,385					1,802	2,032		
Central Pacific	1,368	1,304	18,184,166	16,970,018					13,293	13,014		
Chicago & Northwestern	1,501	1,501	12,467,540	12,811,227					8,306	8,533		
Cincinnati, Lafayette & Chicago	75	75	369,815	399,295					4,951	5,324		
Davenport & Northwestern	157	157	170,914	173,556					1,089	1,105		
Denver & Rio Grande	173	120	469,991	361,770					2,717	3,015		
Des Moines & Minnesota	37	37	59,757	56,388					1,615	1,524		
Hannibal & St. Joseph	296	296	1,927,933	1,661,473					6,513	5,613		
Indianapolis, Bloomington & Western	344	344	1,462,804	1,355,495					4,252	3,940		
Louisville & Nashville	921	921	5,152,290	4,806,543					5,594	5,219		
Missouri, Kansas & Texas	786	786	3,217,277	2,904,925					4,093	3,696		
Mobile & Ohio	527	527	2,093,598	1,914,342					3,972	3,633		
St. Lo., Alt. & Ter. Haute, Belleville Line	71	71	497,923	561,868					7,013	7,914		
Southern Minnesota	170	170	636,841	623,610					3,746	3,668		
Toledo, Peoria & Warsaw	237	237	1,411,792	1,120,458					5,957	4,928		
Totals	6,809	6,685	48,358,649	46,003,382					7,106	6,882		
Total of all lines	26,292	25,900	202,255,169	196,949,633					7,693	7,604		

Carolina and also of the Jacksonville, Pensacola & Mobile Company.

Chicago & Lake Huron.

A committee, appointed by the holders of Port Huron & Lake Michigan bonds, at a recent meeting, has prepared a plan, which provides for a separate reorganization of that section of the line:

By this plan foreclosure proceedings are to be be pushed, every effort made to enforce the lien on the whole line from Port Huron to Lansing, the removal of the present Receiver urged and a thorough examination of his accounts made, and the property bought for the bondholders at the foreclosure sale. The new company is to issue $2,000,000 first mortgage 7 per cent. bonds and $900,000 of stock, each of the old $1,000 bonds to be represented by a new $1,000 bond and $500 of stock, and the other $200,000 of bonds to be used for improving the property. William C. Beardsley, Auburn, N. Y.; A. H. Tremain, Albany, N. Y.; Charles W. Hassler, No. 7 Wall street, New York; C. S. Titus, Albany, N. Y.; (and such other or others of the bondholders as they may select) are to be a committee with full power to carry out the plan.

California Pacific.

A San Francisco dispatch of March 21 says: "The Supreme Court has rendered a decision in the case of Low against the Central Pacific Railroad Company.

"The court finds that the Central Pacific Company must pay the principal and interest of California Pacific Railroad bonds which it guaranteed."

Austin & Pacific Short Line.

A corps of engineers have begun the survey of this projected line from Austin, Tex., westward, and it is said that a contract has been let for the grading of 25 miles.

Dividends.

Dividends have been declared by the following companies:

Union Pacific, 2 per cent., quarterly, payable April 2.

Lehigh Valley, 1¼ per cent., quarterly, payable April 16.

Dubuque & Sioux City (leased to Illinois Central), 1½ per cent., payable April 16.

United New Jersey, 2¼ per cent., quarterly, payable April 10.

Syracuse & Chenango.

Pursuant to notice this road was sold in Syracuse, N. Y., March 17, under a decree of foreclosure of the first mortgage granted by the New York Supreme Court. The property was sold in three parcels, the real estate in Syracuse being bought by C. H. Fitch for $10,000; the track north of Lock street, Syracuse, by A. A. Howlett for $2,500, and the road from Lock street, Syracuse, to Earlville, 43 miles, by J. J. Belden, for $150,000. Under the agreement already made by the bondholders, a new company will be organized at once, to which the property will be transferred.

St. Louis, Kansas City & Northern.

It is announced that Drexel, Morgan & Co., of New York, have anticipated the option they held for the purchase of the remaining $2,000,000 of the real estate mortgage bonds of this company.

Evansville, Owensboro & Nashville.

The U. S. District Court at Louisville, Ky., has ordered a new sale of the property. The sale will be made under the original proceedings in bankruptcy. The road is 31 miles long, from Owensboro, Ky., to the crossing of the Paducah & Elizabethtown road.

Joliet & Valparaiso.

Some interest has been revived in this projected line from Valparaiso, Ind., to Joliet, Ill., and efforts are being made to secure subscriptions and local aid along the line.

Selma, Rome & Dalton.

Notice is given that under a decree of the Alabama Chancery Court B. H. Craig, Register, will begin on May 1, at his office in Selma, Ala., to take account of the amounts due to all the creditors of this company and of the former Alabama & Tennessee Rivers Company and to all holders of certificates issued by the Receivers of the road. All creditors must present their claims and proofs to the Register on or before June 1, or be excluded from all share in the proceeds of the sale of the property.

Central, of New Jersey.

The ten days' notice given by the Lehigh Coal & Navigation Company requiring the Central to pay up the arrears of rent due on the Lehigh & Susquehanna road or surrender the lease, expired March 15. No measures, however, have been taken to enforce the demand, and it is understood that none will be at present.

On behalf of the employes, acting through a committee, application was made to the Chancellor of New Jersey on March 16 for a rule to show cause why the Receiver should not be directed to pay up the arrears of wages due. The Chancellor granted the rule, making it returnable March 22.

A meeting of the bondholders of the Lehigh & Wilkesbarre Coal Company was held in New York, March 19, but little was done except to hear a report from the Receivers and to appoint a committee to examine into the condition of the company and to report to a future meeting.

Meetings.

Meetings will be held by the following companies at the times and places given:

South Carolina, annual meeting, at the hall of the Bank of Charleston, in Charleston, S. C., April 10, at 11 a. m.

Raleigh & Augusta Air Line, annual meeting, at the office in Raleigh, N. C., April 6, at 4 p. m.

Cincinnati & Portsmouth, special meeting, in Mt. Washington, O., March 30, at 10 a. m.

St. Louis, Alton & Terre Haute, first-mortgage bondholders, to choose a trustee, at the company's office, No. 12 Wall street, New York, April 7, at noon.

Seattle & Walla Walla.

This road is now completed from the town of Seattle, Washington Territory, southward to the Renton Coal Mine, about 15 miles, and has been formally opened for traffic. The shipments of coal from the Renton and Talbot mines are now to pass over the road to Seattle as their shipping point.

Wilmington & New Castle.

Books have been opened for subscriptions to the stock of this company, which purposes building a narrow-gauge road, for passenger traffic principally, from Wilmington, Del., south by west to New Castle, about six miles.

Cleveland, Tuscarawas Valley & Wheeling.

At the annual meeting in Cleveland, O., March 14, the stockholders voted: 1. To extend the road from Uhrichsville, O., the present southern terminus, to Bridgeport on the Ohio River and thence along the river to West Wheeling.

2. To increase the capital stock from $1,250,000 to $3,000,000.

3. To authorize a new mortgage on the road and the issue of $2,000,000 new 7 per cent. bonds, $1,000,000 to be used in retiring and canceling the present bonds, and the rest in building the extension as above.

Piedmont Narrow-Gauge.

This new company purposes building a narrow-gauge road from Reidsville, N. C., northward through Leaksville to the Virginia line, about 15 miles.

Davenport & Northwestern.

The trustees, who bought the Davenport & St. Paul road at foreclosure sale, have finally transferred the property to the Davenport & Northwestern Company, organized by the bondholders. The new company issues $3,420,000 stock and $1,700,000 gold bonds, to be secured by a new mortgage on the property, both stock and bonds to be issued in accordance with the agreement made by the bondholders of the old company.

St. Paul & Pacific.

The St. Paul *Pioneer-Press* says: "Good news for the upper country and Minnesota in general. We are authorized to state that the Brainerd Branch will certainly be constructed and put in running order during the coming Summer. What is known as the Brainerd Branch is the line from Watab to Brainerd, a distance of about 60 miles.

"On the Brainerd end of this line four miles of iron are already laid, and the grading, bridges and culverts are completed, save about four miles at the Watab terminus. The ties re also distributed along the entire line, and there remain but three small Howe truss bridges to put in.

"General Rosser, from whom our information is obtained, assures us that the completion of the road as above is a certainty, and we may also state that in view of the fact that the Northern Pacific will require his services, he will not be a candidate for re-election as City Engineer, this spring."

Atlantic & Great Western.

The trustees of leased line rental trust bonds of 1873 announce (in London) that the amounts received from dividends on the shares of the Shenango & Allegheny Railroad Company and the Mercer Mining Company, held as security for the above issue, are sufficient to admit of a distribution of 25s. per bond. This payment will be made to the holders of the January, 1875, coupons, at the office of Messrs. Morton, Rose & Co., on and after the 12th of March.

New Haven & Northampton.

On March 20 the Connecticut Supreme Court gave its decision in the long-pending Plantsville depot case. The decision was in favor of the town and directed that the existing injunction be dissolved and that the peremptory *mandamus* issued by the Superior Court be enforced. This *mandamus* directed the company to stop its train at the Plantsville depot, but its operation has been heretofore prevented by the injunction now dissolved. Under the order of the Court President Yeamans was at once arrested and placed in jail and the court officers were directed to arrest all the directors who could be found. They will be retained in custody until the writ is obeyed and trains are stopped at the Plantsville depot. The company intends to carry the case into the United States courts.

St. Louis & Iron Mountain.

Mr. Thomas Allen, President of the company, has addressed to the St. Louis *Republican* a letter concerning his controversy with the Barings from which we copy the following, which, besides his version of the terms of the agreement (which is substantially the same as that given by the Barings' attorneys) and its purpose (which is different) gives some interesting information concerning the financial history of the road:

"Ten years ago last January, in connection with Mr. H. G. Marquand, of New York, I purchased of the State the St. Louis & Iron Mountain Railway, then completed only to Pilot Knob, 86 miles from St. Louis. I gave my personal bond in the sum of $500,000 that we would extend the road to Belmont in three years. The Governor of the State, under the pretence that we were not getting on as fast as the law required, seized the road in January, 1868, and though it was returned by the Legislature in March, its credit was badly damaged, and we sustained an immense loss. Yet it was completed in eighteen months, and in a year or two after its completion its earnings were so encouraging that we concluded to extend it into Arkansas, and with that view purchased at a very heavy cost the Cairo & Fulton Railroad, then under construction in that State. During this period Messrs. Baring Brothers & Co., of London, among others, voluntarily came forward and purchased a considerable amount of our bonds with a bonus of 33 per cent. of stock. We subsequently borrowed of them £300,000 at a pretty round rate of interest and commission, which we settled in London in 1874 by second mortgage I. M. bonds, at 72½, consolidated bonds at 65 and stock at 30. Still, when we reached Red River the companies were out of means, and Mr. Marquand and I were obliged to advance on our own personal credit and resources about two millions to carry the road across Red River to a connection with the proposed Texas system of roads, without which the bonds already issued would have been valueless. But our whole system was completed, embracing 685 miles, and the several roads consolidated in 1874 under the present name.

"At this time the sum of the capital stock amounted to $26,500,000, of which about $5,000,000, three-fifths being contributed by Messrs. Allen and Marquand, was returned to the treasury of the company by consolidation. The bonded debt was about $24,000,000, and the floating debt was not far from $3,000,000.

"Early in 1875 it became apparent that the company could not pay both its floating debt and the interest on its bonds. It was then agreed that we should ask the bondholders to fund coupons amounting to about $2,250,000 in order to gain time and means to pay off the floating debt. The circular to the bondholders was prepared by Mr. Ward and generally assented to. After the Barings had assented and the funding was about three-fourths secured, it occurred to some of the New York gentlemen that Mr. Marquand and Mr. Allen should give some assurance that they would not sell out, and for the purpose of keeping the control out of the street, and to secure co-operation in future voting at elections of the three principal parties until the company resumed payment of its interest, a "pool," made up of a certain percentage of the stock, should be created. Considering that the bondholders had generally joined Allen Marquand in funding for the purpose of paying the floating debt, it was urged upon these two large stockholders and bondholders, that it would be a graceful act to place two or three millions of their stock with the Barings, in trust, and with the same power to vote at any election as Allen and Marquand would have if personally present. This was finally agreed to on the 19th of April, 1875, and Allen and Marquand each placed 12,500 shares in trust with the Barings, with the distinct understanding, though not so expressed in the writing, that it was for 'keeping together,' 'co-operating,' and, indeed, voting 'our'—*i. e.*, A. and M.'s—'ticket.' At the election in 1876 Allen and Marquand voted these 25,000 shares."

Mr. Allen adds that some differences finally arose between the management and Mr. Ward, one being as to the necessity of a General Manager, another as to the policy of pro-rating on Texas business with the Memphis & Little Rock and the Louisville & Nashville, in which latter road he says that the Barings have a considerable interest. These differences culminated in what Mr. Allen considered an open declaration of war, in the attempt to vote on the 25,000 Allen and Marquand trust shares so as to remove Allen and Marquand from the directory, and choose one entirely of Eastern men. In concluding he says: "But damaging as such a contest is, and already has been, to all the interests and particularly to the credit of the company, I feel assured that the foreign party has too large an interest to attempt the destruction of the present corporation. And, under any circumstances, I feel warranted in saying, from my knowledge of the growing business of the road, to all our unsecured creditors that they will all be paid in full, even though the houses of Allen and Marquand may be pulled down in the fight."

Philadelphia & Reading.

This company has issued a new order, or rather directed the

enforcement of an old one, which requires that no employe of the road shall hold any position in the government of any of the towns or cities on the line of the road. The order produced the greatest effect at Reading, where a large number of men are employed in the shops, and quite a number had been chosen members of the City Councils and School Board—so many, indeed, that their resignation left one branch of the City Council without a quorum.

To meet the low prices of coal, the rates on coal to Port Richmond have been largely reduced. The present rates are said to be the lowest ever charged since the road was opened, the rate from Schuylkill Haven to Port Richmond being 90 cents per ton.

Wabash.

A circular issued by the company says that the recent application for a receiver is made of E. J. Harding, who owns only five Great Western second-mortgage bonds, and that it is generally opposed by bondholders. Mr. Harding, on the other hand, claims to own $20,000 of bonds and to represent $700,000 more, and says that his suit has been begun because the new company has arranged to use the net earnings of the road to pay off floating debt and later liens, thus disregarding the prior claims of the older bondholders.

Western North Carolina.

The law providing for the completion of this road by the State of North Carolina expressly provides that none of the liabilities of the old company are to be assumed. The capital stock is fixed at $850,000, of which the State holds $637,500 and $212,500 is to be issued to the stockholders of the old company in payment for certain rights not covered by the foreclosure sale. Provision is made for employing 500 convicts on the road, the work of grading to continue both on the main line to Cherokee and the branch from Asheville to Paint Rock. Finally, the act appropriates $70,000 for the purchase of rails to be laid during the present year.

Cincinnati Southern.

The trustees have appointed a board of three experts to examine and report on the work on the line of this road. The board consists of Albert Fink, formerly General Superintendent of the Louisville & Nashville; Mr. F. de Funiak, Chief Engineer of the same road, and Mr. John McLeod, Receiver of the Louisville, Cincinnati & Lexington, who is also an engineer.

Minneapolis & St. Louis.

It is again reported that this company has concluded arrangements to build the proposed extension of its road southward to the Iowa line, and that the work will be done next summer.

Beef River Valley.

A company by this name has been organized to build a railroad from the Green Bay & Minnesota near Merrilan, Wis., westward through Osseo, Mondovi and Modena to the Mississippi at some point near or opposite to Wabasha, Minn. The distance is about 60 miles. A survey is to be begun very soon. The office of the new company is at Mondovi, Buffalo County, Wis.

Jamesville & Washington.

This road, which was built to carry lumber, has been for some time in operation from Jamesville, N. C., on the Roanoke River, southward 10 miles. Work is now in progress on an extension of 15 miles to Washington on the Pamlico River.

Ohio River.

A company by this name has been organized to build a railroad from Aberdeen on the Ohio River, in Brown County, O., northwest through Ripley to Georgetown, about 20 miles.

West Lebanon & Alvin.

It is proposed to build a railroad from West Lebanon, Ind., westward to the Chicago, Danville & Vincennes at Alvin, Ill., about 15 miles.

Hannibal & Naples.

A meeting of bondholders was held in New York, March 17, to consider the best action to be taken in view of the approaching sale of the road under foreclosure. After some discussion, a committee was appointed to see if some arrangement could not be made to reconcile the conflicting interests of the first and second-mortgage bondholders. It was stated that the road had never paid expenses, and that the second-mortgage bonds had been issued principally to meet deficiencies.

Spencer Branch.

Surveys are to be made for a short line of about three miles, to connect the village of Spencer, Mass., with the Boston & Albany road. Two lines will be run, one to Spencer Station, the other to East Brookfield.

Southbridge & Brookfield.

The proposal of John Gilman to build this road if town subsidies of $200,000 were given him has not been accepted. An effort is now being made to raise the money needed by stock subscriptions, but progress is very slow. There is much difference of opinion as to location, some parties wishing to make the Boston & Albany connection at East Brookfield, while others prefer a different line. The final location will probably depend upon the amount of subscriptions that can be secured on the line adopted.

Nevada Central.

The running of trains on this road has been resumed after a stoppage of several months. The road, which is 18 miles long, extends from Pioche, Nev., to Bullionville, and is chiefly used for carrying ore from the Pioche mines to the mills.

Stevens Point & Lake Superior.

The latest project is for a narrow-gauge road from Stevens Point, Wis., northward to L'Anse, Mich., at the head of Keweenaw Bay on Lake Superior. The distance is about 175 miles, and for a great part of the distance the country is almost without inhabitants.

Chicago, Quincy & St. Louis.

A company by this name has been organized to build a railroad from Quincy, Ill., southeast by way of Payson and Pittsfield to East St. Louis, about 120 miles. The capital stock is fixed at $1,500,000.

St. Louis, Lawrence & Western.

It is reported that the Atchison, Topeka & Santa Fe Company has completed arrangements with the purchasers of this road at the late foreclosure sale, and will work the road under lease. It runs from the Missouri Pacific at Pleasant Hill, Mo., westward through Lawrence, Kan., to Carbondale, on the Atchison, Topeka & Santa Fe, and is 93 miles long. The Santa Fe Company has heretofore used 17 miles of the road, from Lawrence to De Soto, as part of its Kansas City line.

New Jersey & New York.

The bondholders' committee has prepared a plan of reorganization which is as follows:

1. First-mortgage 7 per cent. bonds to be issued to the amount of $400,000, to be exchanged for the outstanding Hackensack & New York and Hackensack & New York Extension bonds, and used to pay for equipment now in use on the road and for necessary improvements.
2. Second-mortgage 7 per cent. bonds, to bear interest from May 1, 1880, to be issued to the amount of $600,000, and to be exchanged for Hackensack and New York Extension second-mortage bonds; two shares of stock to be given with each $1,000 bond.
3. Income bonds, to bear 7 per cent. interest, if earned after Sept. 1, 1882, to be issued to the amount of $800,000, to be exchanged for the outstanding consolidated bonds, floating debt, etc.; 3¾ shares of stock to be given with each $1,000 bond.
4. Stock to the amount of $1,000,000, of which $400,000 will be given to bondholders as above, and $560,000 to holders of recognized stock of the old company, on payment of $2 per share. This assessment to be used to pay expenses of foreclosure and reorganization.

This will make the capital account of the reorganized company $27,397 per mile in mortgage bonds, $21,918 in income bonds and $27,397 in stock, or $76,712 per mile in all. The net earnings for the last year reported were sufficient to pay 7 per cent. on about $775,000, or $21,233 per mile.

Peoria & Rock Island.

On March 12 the United States Circuit Court dismissed the petition to amend the decree of foreclosure filed by certain bondholders. At the same time the Court directed an order to be entered that all claims to share in the proceeds of the sale must be filed within 25 days, with the necessary proofs and a sufficient bond for costs.

Henry W. Bishop, Master in Chancery, gives notice that he will sell the road at public sale under the decree of foreclosure as granted, in Chicago, April 4. The sale will include the road from Peoria, Ill., to Rock Island, 91 miles, with all the equipment and other property, and will be made subject to a prior mortgage for $150,000 made by the old Rock Island & Peoria Company; to all unpaid taxes and to a contract with the Coal Valley Mining Company, whereby that company receives a royalty on all coal passing over the road. The purchaser will be required to pay $100,000 in cash, but bonds and unpaid coupons will be accepted for the balance of the purchase money.

Chicago & Illinois Southern.

This road was sold under a decree of foreclosure granted by the United States Circuit Court in Springfield, Ill., March 13. The road from Mattoon, Ill., to Hervey City, 33 miles, was sold for $37,000 to George L. Ingersoll, of Cleveland, O., acting as agent for the bondholders. The same party also bought the company's interest in the 10 miles of track used jointly with the Illinois Midland from Hervey City to the junction with the Illinois Central near Decatur.

Erie.

The following advertisement appeared in the London *Times* of Feb. 24, signed by J. D. Ayers, Secretary, No. 1 Queen Victoria street:

"ERIE RAILWAY RECONSTRUCTION.—Assents have now been received in respect of one-half of the aggregate construction, and they are rapidly increasing in number, so that the trustees have a confident opinion of the success of the scheme.

"But they have to state, in reply to many inquiries, that in the event of non-success the shareholders who pay the assessment may rely on its return, either intact or subject to a very small deduction for necessary expenses; these expenses, the trustees can give the strongest assurance, cannot exceed a shilling per share, even if only half the shareholders should come into the scheme.

"Those who, not later than 31st March, pay the assessment (four dollars ordinary shares or two dollars preference shares) may until 1st July pay two dollars ordinary or one dollar preference additional and receive income bonds accordingly.

"The trustees intend to invest the assessment fund (less a proper bank balance) in English or United States Government securities, as per printed scheme. When the assessment money becomes applicable after the foreclosure, it will be applied strictly to improvements of the line and equipment, under the special supervision of Governor Morgan and J. Lowber Welsh, Esq., acting with the President and in correspondence with the trustees in London. This is arranged in concert with Messrs. J. S. Morgan & Co.

"At the urgent request of a large representative meeting in the North of England, the trustees have consented to accept all payments till 31st March inclusive, without the extra 10 per cent., but with the addition of interest at 5 per cent. per annum from 1st March to date of payment.

"Share certificates need not be sent in, but only assent forms, duly filled up, accompanied by check."

Argentine Railroads.

Mr. Charles Burton, telegraph engineer, of Buenos Ayres, sends to *Herapath's Journal* the following list of railroads as completed in the Argentine Republic at the beginning of this year:

	Miles.
Cordoba to Tucuman (National Government)	340
Villa Maria to Villa Mercedes (National Government)	158
Gualequay to Port Ruiz (National Government)	6
Buenos Ayres to Azul and Dolores (Great South rn Railway)	275
Rosario to Cordoba (Central Argentine Railway Company)	246
Buenos Ayres to Bragado, Lobos, etc., "Westeru" (Provincial Government)	184
Concordia to Monte Caseros (East Argentine Railway Company)	96
Buenos Ayres & Campana Port Railway Company	48
Buenos Ayres & Ensenada Port Railway Company	35
Buenos Ayres to Tigre (Northern Railway Company)	18
Total	1,406

"The Cordoba to Tucuman is one metre gauge. The Gualequay to Port Ruiz and the Concordia to Monte Caseros are 1 metre 44 c. m. [4 ft. 8½ in.] gauge. All the rest are 5 ft. 6 in. gauge.

"The only railway in the Republic with double line of rails is the Northern of Buenos Ayres, and that only for one-third of its total length."

Southern Minnesota.

On March 8 the Receiver surrendered possession of this road to the new company organized by the bondholders who bought the property Feb. 10, when it was sold under foreclosure of the second or equipment mortgage. The new company is named the Southern Minnesota *Railway* Company.

Fall River.

This company has "leave to withdraw" from the Massachusetts Legislature on its petition for authority to issue $75,000 preferred stock.

New Orleans, Jackson & Great Northern.

In accordance with previous notice this road was sold at public sale, under a decree of foreclosure of the consolidated mortgage granted by the United States Circuit Court, in New Orleans, March 17. The property was bought for $1,050,000 by Mr. Schrieber, who acted as agent for the Purchasing Committee appointed by the bondholders. The largest holder of the bonds is the Illinois Central Company.

Coast Line.

At the annual meeting of this company in Savannah, Ga., last week, the earnings of the road (which is a suburban line used chiefly for pleasure travel) for the year ending Feb. 28 were reported at $14,529; expenses, $10,657; net earnings, $3,872; $3,854 was paid for interest, leaving a balance of $18. The President reported that the abandonment of steam as a motive power was under consideration. During January and February, as an experiment, the line was run with mules entirely, with a resulting decrease of 20 per cent. in expenses. Those two months were the period of lightest travel, but it was intended to continue the experiment for three or four months, and to give the mules a fair trial.

East & West Texas.

The grading of this road has been completed from Houston, Tex., eastward to the San Jacinto River and some work has been done beyond. A contract for grading a second section of 25 miles has been let and work begun. Two engines, several flat cars and a lot of iron have been received at Houston, and tracklaying was to have been begun this week.

Baltimore & Delta.

It is proposed to build a narrow-gauge road from Baltimore north by east to Delta in Harford County, near the Pennsylvania line, a distance of about 38 miles. The object is to serve the local traffic and hereafter to extend the line to a connection with the Peach Bottom road in Pennsylvania.

St. Croix & Penobscot

The people of Calais, Me., have voted by a large majority against granting aid to the proposed extension of this road to a connection with the European and North American. This puts an end to all prospect of the building of the extension this year.

New London Northern.

The large wharf lately built by this company at New London, Conn., is to be used as a coal wharf and depot. Arrangements have been made with the Philadelphia & Reading Company to run two of its steam colliers regularly to New London and preparations are being made for a large business there.

Gulf, Western Texas & Pacific.

The bridges between Victoria, Tex., and Cuero are being rebuilt. The final location of the proposed extension from Cuero to Gonzales has not been decided on, but some of the rails have been purchased.

Baltimore & Ohio.

The Baltimore *Gazette* says: "An order has been issued by the Baltimore & Ohio Railroad Company dividing their engineers into four classes, to receive respectively $3.25, $3, $2.75 and $2.50 per day. Heretofore they have been divided into two classes only, but this was found not to grade the workmen sufficiently, hence the present change. The two lower grades apply only to the new men which the company will from time to time take into their employ. The new arrangement does not reduce the pay of those in the employ of the company, but gives to the new incomers somewhat lower wages than they have been receiving."

Covington, Lexington & Pound Gap.

Work has been suspended on this road, the contractors having failed to carry out their agreements. Supply-bills, subcontractors and workmen are unpaid and there is much trouble along the line in consequence.

Nova Scotia, Nictaux & Atlantic Central.

The contract for the construction of this road has been finally executed and the contractors, Walker, Clark & Roberts, of New York, are to begin work by May 1. The road has a subsidy from the Province of Nova Scotia of $5,000 per mile. It is to be about 65 miles long, running from Middleton, N. S., on the Bay of Fundy southeast through the Nictaux and La Have valleys to Lunenburg on the Atlantic coast.

Garrett County.

It is proposed to build a railroad from a point on the Baltimore & Ohio, near Oakland or Deer Park, in Garrett County, Md., northward to the Pittsburgh Division of the same road, near Confluence, Pa. The distance is about 30 miles, the line following the Youghiogheny River the whole distance. The object of the road is to open up some large deposits of coal and other minerals.

Philadelphia, Wilmington & Baltimore.

A slight trouble has arisen between this company and the Post Office Department, the company having required extra pay for carrying from Philadelphia to Lamokin Junction the mails intended for the Philadelphia & Baltimore Central road. The Department declined to allow any additional pay, and considerable delay to the mails is likely to result. The Department has since organized a line of wagons to run between Philadelphia and Lamokin to carry the mails.

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North Pennsylvania.

This company owns a main line from Philadelphia northward to Bethlehem, 55.6 miles; a branch from Lansdale to Doylestown, 10.3 miles; a branch to Shimerville, 1.8 miles, and the Delaware River Branch, from Jenkintown to the Delaware River at Yardley, 20.5 miles, making 88.2 miles in all. The Delaware River Branch, which, with 9 miles of the Main Line, from Philadelphia to Jenkintown, forms a part (about one-third) of the New Line between New York and Philadelphia, was not opened until May 1, making the average for the year 77.95 miles. The company also works under lease the Northeast Pennsylvania, from Abington to Hatboro, 9.8 miles and the Stony Creek road, from Lansdale to Norristown, 10.3 miles, but their earnings are reported separately. The report is for the year ending Oct. 31, 1876.

The capital account at the close of the year was as follows:

Stock ($45,353 per mile)		$4,090,100 00
Bonds	$5,985,000 00	
Ground rents and mortgages	449,783 77	
Total ($72,957 per mile)		6,434,783 77
Dividend scrip		156,195 00
Bills and accounts payable		1,028,103 58
Profit and loss		454,356 80
Total ($136,888 per mile)		$12,073,539 15

There was an increase during the year of $21,950 in stock; of $194,540.55 in funded debt, and of $774,139.47 in bills and accounts payable.

The work done during the year was as follows:

	1875–76.	1874–75.	Inc. or Dec.	P. c
Pass. train mileage	666,683	.....	.....	...
Freight train mileage	345,323	.....	.....	....
Total rev mile'ge	1,012,006	825,860	Inc .. 186,146	22.5
Passengers carried	1,660,084	1,067,494	Inc .. 592,590	55.5
Passenger mileage	39,928,774	18,743,201	Inc .. 21,185,573	113.0
Coal carried, tons	344,098	419,496	Dec.. 75,398	18.0
Pig iron, tons	11,866	27,133	Dec.. 15,267	56.3
Lumber, feet	20,090,096	17,548,440	Inc .. 2,541,656	14.5
Lime, bushels	315,786	350,407	Dec.. 34,621	9.9
Milk, gallons	2,783,748	2,629,457	Inc .. 154,291	5.9
Miscellaneous freight, tons	439,728	411,778	Inc .. 27,950	6.8
Total tonnage mileage	34,195,474	36,757,567	Dec.. 2,562,093	7.0
Average passenger train load, No.	59.89	.....	.....	....
Average freight train load, tons	99.02	.....	.....	....
Average receipt per pass. per mile	2.29 cts.	2.62 cts.	Dec.. 0.33 ct.	12.6
Average receipt per ton per mile	2.46 "	2.55 "	Dec.. 0.07 "	2.8

The great increase of passenger business was due chiefly to the Centennial travel, although a part of it came from the New York line. During the last three months of the year,

August, September and October, the passenger mileage was 57.2 per cent. of that for the whole year, and in October alone 26.4 per cent. of the whole year's mileage. The increase in travel was accompanied by a great decrease in rates, the average receipt per passenger per mile being 1.57 cts. in October, 1.75 cts. in September, and 1.91 cts. in August, the average for the whole year being 2.29 cts.

Of the 58 engines owned by the company, 29 were employed on passenger service, 19 on freight and 10 on switching and service trains. The cost of engine service per train mile (not including enginemen's and firemen's wages) was 14.8 cts. per mile for passenger and 21.1 cts. per mile for freight service.

Notwithstanding the great increase in traffic and train mileage there was a slight decrease in expenses. This was due partly to economy of management and lower prices, and partly also to the fact that trains were better filled, the increase in train mileage being very much less than that in passenger traffic.

The earnings for the year were as follows :

	1875-76.	1874-75.	Inc. or Dec.	P. c.
Passengers.....	$796,941 65	$484,392 90	Inc .. $312,548 75	64.5
Freight.....	833,185 28	908,406 35	Dec.. 75,221 07	8.3
Mail.....	6,078 80	6,195 00	Dec.. 116 20	1.9
Rents, etc.....	39,660 18	18,740 36	Inc .. 20,919 82	111.9
Total.....	$1,675,865 91	$1,417,734 61	Inc .. $258,131 30	18.2
Working expenses.....	889,346 78	905,542 27	Dec.. 16,195 49	1.8
Net earnings...	$786,519 13	$512,192 34	Inc .. $274,326 79	53.6
Gross earnings per mile.....	21,499 24	20,941 43	Inc .. 557 81	2.7
Expenses per mile.....	11,409 20	13,375 81	Dec.. 1,966 61	14.6
Net earnings per mile.....	10,090 04	7,565 62	Inc .. 2,524 42	33.4
Per cent. of expenses.....	53.07	63.87	Dec.. 10.80	16.9

The earnings of the two leased branches, which are reported separately, were as follows :

	Gross earnings.	Expenses and interest.	Deficit.	Earn. per mile.
N'theast Pennsylvania..	$27,706 93	$35,828 11	$8,121 18	$2,827
Stony Creek.....	17,006 12	51,955 09	34,948 97	1,651
Total.....	$44,713 05	$87,783 20	$43,070 15	.....

The earnings of the Northeast Pennsylvania increased $3,051.93, or 12.4 per cent.; those of the Stony Creek decreased $1,636.10, or 8.8 per cent. The Northeast Pennsylvania earned $9,373.01 over working expenses. Both roads furnished considerable traffic to the Main Line.

The net result of the year was as follows :

Net earnings.....	$786,519 13
Interest and insurance, less interest received.....	460,115 24
Net balance.....	$326,403 89

From this surplus two dividends of 3 per cent. each were declared and paid, leaving a balance to credit of profit and loss (adding surplus from the previous year) of $454,356.80. During the year 17,053 feet of new sidings were laid, principally in Philadelphia ; a new freight house built, the passenger depot enlarged and other improvements made in Philadelphia ; a new passenger house built at Doylestown, and finally the Delaware River Branch completed with a double track. The total additions to permanent accounts were :

Completion of Delaware River Branch.....	$945,696 85
Other construction.....	70,108 61
New equipment.....	210,360 28
Total.....	$1,226,165 74

The new equipment consisted of 6 heavy passenger, 2 ten-wheel freight and 2 shifting engines ; 15 passenger, 2 smoking and baggage and 64 box cars. One engine was also built to replace one broken up, and charged to expenses.

The Delaware River Branch, 20.5 miles long, with iron bridges and a double track laid with 66-lbs. steel rails, has cost in all $1,779,430.60, or $86,801 per mile. It passes through a well settled and prosperous country, and, besides the business of the New York line, it has already a considerable local traffic both in passengers and freight, the latter largely in milk and market produce. The New York line has been worked thus far with satisfactory results ; each of the three companies concerned—the North Pennsylvania, the Delaware & Bound Brook and the Central of New Jersey contributes a *pro rata* share of the equipment, the earnings being also divided *pro rata*. The agreement has worked satisfactorily.

Notwithstanding the unusual amount of work done over the line, the road and equipment have been fully maintained. The relations with connecting lines are satisfactory and harmonious.

Train Accidents in February.

On the evening of the 1st an axle broke under a car in a freight train on the Pennsylvania Railroad, near Powelton, Pa., and sixteen cars were thrown from the track, some of them being badly wrecked.

Very late on the night of the 1st a train on the Pittsburgh, Cincinnati & St. Louis road was thrown from the track by the spreading of the rails near Indianapolis, Ind., the engine and three cars leaving the track. Some of the rail fastenings are said to have been removed by persons unknown.

On the morning of the 2d the sleeping coach of an express train on the Atchison, Topeka & Santa Fe road was thrown from the track and upset by a broken rail near Newton, Kan.

On the evening of the 2d several freight cars of a train on the Chicago, Milwaukee & St. Paul road were thrown from the track by a broken rail near Janesville, Wis., and badly broken.

Late on the night of the 2d some cars of an express train on the Intercolonial Railway were thrown from the track near Barnaby River, N. B., by the breaking of a wheel under the tender. The road was blocked 5 hours.

On the morning of the 3d a passenger train on the Memphis Line of the Louisville & Nashville road ran into some cars which had broken loose from a preceding freight train near Carbondale, Tenn. The engine and several freight cars were wrecked, the engineman and conductor of the passenger and two men who were in the freight caboose were badly hurt.

On the morning of the 3d the sleeping car of an express train on the Connecticut & Passumpsic Rivers road was thrown from the track at Barnet, Vt., by a broken rail. The car was much damaged.

On the 3d some cars of a freight train on the Pennsylvania Railroad were thrown from the track near Gallitzin, Pa., and the conductor was badly hurt.

On the night of the 3d the engine and two cars of a passenger train on the Western Maryland road were thrown from the track by a misplaced switch at Cavetown, Md. The switch had been purposely misplaced and the switch-rod detached, leaving the signal to indicate safety.

On the morning of the 5th, as a train on the Central Railroad of New Jersey was passing from the Newark Branch to the Main Line at Communipaw, N. J., a train on the Main Line came up at a great speed and struck the last car of the Newark train near the middle, throwing it over into the ditch, breaking it badly and injuring a passenger and a brakeman. It is said that the usual signal was displayed, but the Main-Line train paid no attention. The tracks approach each other at an angle of about 30°, and one can be seen from the other for half a mile, except for about 50 yards at the junction.

On the night of the 5th a coal train on the St. Louis & Southeastern road ran into a caboose and three cars which had broken loose from a preceding freight train and were standing on a trestle near Berkner, Ill. The freight cars were wrecked and the coal engine was thrown over on one side of the trestle, several coal cars falling on the other side. The trestle was much damaged. The fireman was killed, the engineman and two brakemen badly hurt. A brakeman had gone back to signal the coal train, but his light suddenly went out just as the train came along.

On the morning of the 6th a freight train on the St. Louis, Rock Island & Chicago road was thrown from the track near Whitehall, Ill., by the spreading of the rails, and five cars were upset and badly broken.

On the morning of the 6th a passenger train on the Grand Trunk ran into the head of a freight train which was backing into a siding at Brockville, Ont. Both engines were damaged.

On the morning of the 7th an engine on the Chicago, Rock Island & Pacific road ran into a car which was standing on the track in the yard at Leavenworth, Kan., doing some damage.

On the 7th two cars of a mixed train on the Columbus & Hocking Valley road ran off the track near Gore, O.

On the 7th an engine on the Indianapolis, Cincinnati & Lafayette road ran off the track in Indianapolis, Ind., doing some damage.

On the morning of the 8th a freight train on the Delaware road ran off the track near Townsend, Del., the accident being caused by a broken axle. Five cars were piled up in a bad wreck and the track blocked two hours.

On the 8th a freight train on the Kansas Pacific road ran over a misplaced switch and into some freight cars standing on a siding at Wamego, Kan. The engine and several cars were damaged.

On the night of the 8th a mixed train on the Port Royal Railroad ran off the track near Augusta, Ga., and three freight cars were wrecked, blocking the road five hours.

On the morning of the 9th there was a butting collision between two freight trains on the Baltimore & Ohio road near Pleasant Valley, O., by which both engines and several cars were wrecked. The cause of the accident is said to have been the failure of an operator at Black Hand to deliver an order which he had received for one of the trains.

On the morning of the 9th a car of a freight train on the Old Colony Railroad ran off the track near Newport, R. I., delaying the train some time.

The car was replaced, but again ran off the track near Tiverton, R. I., and was left on a siding.

Early on the morning of the 10th a car of a mixed train on the Vermont Central road ran off the track on the bridge over the Connecticut at Bellows Falls, Vt., breaking the car badly and damaging the bridge. The accident is said to have been caused by a broken rail.

On the morning of the 10th a coal train on the Central Railroad of New Jersey ran into the rear of a freight train near Phillipsburg, N. J., wrecking several oil cars. The fireman was injured.

On the morning of the 10th, on the Pennsylvania Railroad, there was a butting collision between two freight trains at the Cambria siding near Johnstown, Pa., damaging both engines and a car badly. The accident is said to have been caused by disregard of signals.

On the 12th a car of a passenger train on the Cairo & St. Louis road was thrown from the track at Kaolin, Ill., by a broken axle, blocking the road three hours.

On the evening of the 12th the engine of a passenger train on the Wabash road was thrown from the track near Logansport, Ind., by a misplaced switch.

On the morning of the 13th, as a local passenger train on the Boston & Providence road was running into the yard at Providence, R. I., it ran into a Providence & Worcester shifting engine, which was just coming out of a siding. Both engines and one car were slightly damaged.

On the 13th the baggage car of a passenger train on the California Pacific road ran off the track in Sacramento, Cal.

On the 13th two engines and a snow-plow on the Bangor & Piscataquis road ran off the track in a snow-bank near Milford, Me.

On the afternoon of the 13th a car of a passenger train on the St. Louis, Alton & Terre Haute's Belleville Branch ran off the track at Gartside, Ill. The conductor was thrown from the platform and badly hurt.

Late on the night of the 13th a freight engine and caboose on the Troy & Boston road ran into a sleeping car which had broken loose from a preceding express train and was standing on the track near Eagle Bridge, N. Y. The sleeping car was slightly damaged and the caboose, which was in front of the engine, was completely wrecked. A brakeman was killed, the freight conductor and another brakeman severely and a passenger in the sleeper slightly hurt. It is said that there was no signal light on the sleeping car.

Very early on the morning of the 14th an express train on the St. Louis, Iron Mountain & Southern road was thrown from the track near Jacksonville, Ark., the whole train leaving the track and the engine, mail and baggage cars being upset. The fireman was killed, the engineman very badly and the mail agent and a brakeman less severely hurt. It was found that the fastenings of a rail had been removed, doubtless to wreck the train.

On the afternoon of the 14th the engine of a construction train on the Portland & Ogdensburg road ran off the track near Highgate, Vt.

Late on the night of the 14th a car of a passenger train on the South Carolina Railroad ran off the track near Sineath's, S. C., blocking the road some time.

Late on the night of the 15th, near Clarence, Mo., on the Hannibal & St. Joseph road, a broken rail threw an engine and seven cars of a freight train from the track. The road was blocked ten hours.

On the morning of the 16th a car of a passenger train on the Chicago, Rock Island & Pacific road ran off the track in Leavenworth, Kan.

On the night of the 17th a snow-plow on the European & North American road ran off the track near Enniskillen, N. B., and was badly damaged.

Early on the morning of the 18th a switching engine on the Cleveland, Columbus, Cincinnati & Indianapolis road ran into the rear of a freight train near Cleveland, O., wrecking the caboose, damaging the engine, injuring a brakeman in the caboose and the fireman on the engine.

Very early on the morning of the 19th a freight train was thrown from the track by a misplaced switch in the Boston & Albany yard at Springfield, Mass., and two cars loaded with hogs were badly broken, killing several hogs.

On the morning of the 19th an axle broke under a car of a freight train on the New Haven & Northampton road, near Plainville, Conn., and several cars were thrown from the track.

On the morning of the 20th a freight train on the New York Central & Hudson River ran into the rear of a preceding freight, which had stopped to take water at Fairport, N. Y. The caboose was wrecked and several cars badly damaged; the caboose afterward caught fire and was burned up. The conductor, who was in the caboose, was badly hurt.

On the 20th a passenger train on the Boston & Maine road ran off the track in the Boston yard, damaging several cars.

On the evening of the 20th an accommodation train on the Cleveland, Columbus, Cincinnati & Indianapolis road ran into the rear of a freight train which had stopped at Greenwich, O., breaking the caboose badly and damaging the engine. The freight had just commenced to back into a siding.

On the afternoon of the 20th the way car of a freight train on the Intercolonial Railway was thrown from the track near Anagance, N. B., by a loose wheel and upset in the snow. The train was delayed an hour.

On the night of the 20th a freight train on the Cairo & Vincennes road ran over an open switch and off the end of a siding at Carmi, Ill., damaging the engine and several cars, injuring the fireman badly and the engineman slightly. It is said that the train should have stopped before reaching the switch, but that the men on the engine were both asleep.

On the evening of the 21st a passenger train on the Boston & Lowell road struck a large stone which had been put upon the track near Billerica, Mass., and the engine and tender were thrown down a bank and badly damaged. Two cars were thrown across the track. The engineman, fireman and four passengers were slightly hurt.

On the morning of the 22d, as an express train on the European & North American road was near Westfield, N. B., a connecting rod on the engine broke, doing some damage to the engine and delaying the train two hours.

Early on the morning of the 24th a passenger train on the Louisville, Cincinnati & Lexington road was thrown from the track by a misplaced switch at Beard's, Ky. The engine and two cars were damaged and two passengers hurt.

On the morning of the 24th a passenger train on the Freehold & Jamesburg road was thrown from the track by a misplaced switch at Squan, N. J.

On the afternoon of the 24th a car of a mixed train on the Utica Division of the Delaware, Lackawanna & Western road jumped the track near Richfield Junction, N. Y., and three freight and two passenger cars left the track and upset down a high bank. The cars were badly broken and eight passengers were hurt, most of them slightly.

On the morning of the 25th a freight train on the St. Louis, Kansas City & Northern road was thrown from the track by some horses which had got fast in a trestle near Wakanda, Mo.

Early on the morning of the 27th a freight train on the Jacksonville, Pensacola and Mobile road was thrown from the track near Baldwin, Fla., by the spreading of the rails. The engine and two cars were wrecked and the cars burned.

On the 27th the locomotive of a log train on the Atlantic, Gulf & West India Transit road exploded its boiler, while standing at Swail's House, Fla. The boiler was torn in two, the wagon-top being torn off and thrown a great distance. The engineman was killed, the fireman fatally and the wood-passer badly hurt. The engine was old but had lately come out of the repair shop.

Early on the morning of the 28th a freight train on the Central Pacific road ran into a car which had been blown from a siding upon the main track at Bantas, Cal. The engine was damaged, 15 loaded cars piled up and badly broken, a brakeman seriously hurt and the road blocked several hours.

On the 28th five cars of a freight train on the Lake Shore & Michigan Southern road were thrown from the track by a broken rail near Burdick, Ind.

This is a total of 56 accidents whereby 5 persons were killed and 41 injured. Four accidents caused the death of one or more persons; twelve caused injuries less than death, while 40, or 71.4 per cent. of the whole, caused no injury serious enough for record.

These accidents may be classed as to their nature and causes as follows :

COLLISIONS:		
Rear collisions	10	
Butting collisions	4	
Crossing collisions	1	
		15
DERAILMENTS:		
Unexplained	14	
Misplaced switch	6	
Broken rail	6	
Spreading of rails	4	
Broken axle	4	
Broken wheel	1	
Loose wheel	1	
Snow or ice	1	
Cattle on track	1	
Malicious obstruction	1	
		39
Boiler explosion	1	
Broken connecting rod	1	
		2
Total		56

Three collisions were caused by trains breaking in two, three by want of signals or neglect to use them and one each by a misplaced switch, by mistake in orders and by cars blown out of a siding. One malicious obstruction, one switch purposely misplaced and two accidents where rail fastenings had been maliciously removed make up four cases of train wrecking. There were 21 accidents resulting directly from defect or failure of road or equipment. Of the 15 collisions one was between two passenger trains, five between a freight and a passenger and nine between two freight trains; 20 derailments were of passenger and 19 of freight trains; of the two other accidents one was to a passenger and one to a freight train.

Compared with February, 1876, there was a decrease of 35 accidents, of 10 in the number killed, and of 27 in that injured.

The month is in sharp contrast to the preceding one, when there were 147 accidents, and the difference is due evidently to the weather. January was a month of severe weather and frequent storms; February was unusually mild, with few storms and those extending over a limited area, and the difference is shown in a marked way. The number of accidents recorded in February was smaller than in any month of the past twelve, with one exception (June), though an exactly equal number was recorded in April. The number of killed and injured was also unusually small.

For the year ending with February the record is as follows:

	No. of accidents.	Killed.	Injured.
March.....	109	30	96
April.....	56	6	47
May.....	64	13	126
June.....	52	19	79
July.....	79	17	69
August.....	78	22	76
September.....	106	41	133
October.....	103	40	115
November.....	96	23	126
December.....	88	94	141
January.....	147	10	146
February.....	56	5	41
Totals.....	1,034	320	1,199

The averages per day for the month were 2 accidents, 0.19 killed, and 1.46 injured; for the year they were 2.83 accidents, 0.88 killed and 3.26 injured. The averages for the month were thus all much below those for the year. The average casualties per accident were for the month, 0.089 killed and 0.732 injured; for the year, 0.309 killed and 1.150 injured. The yearly averages are increased by the great number of casualties at Ashtabula in December.

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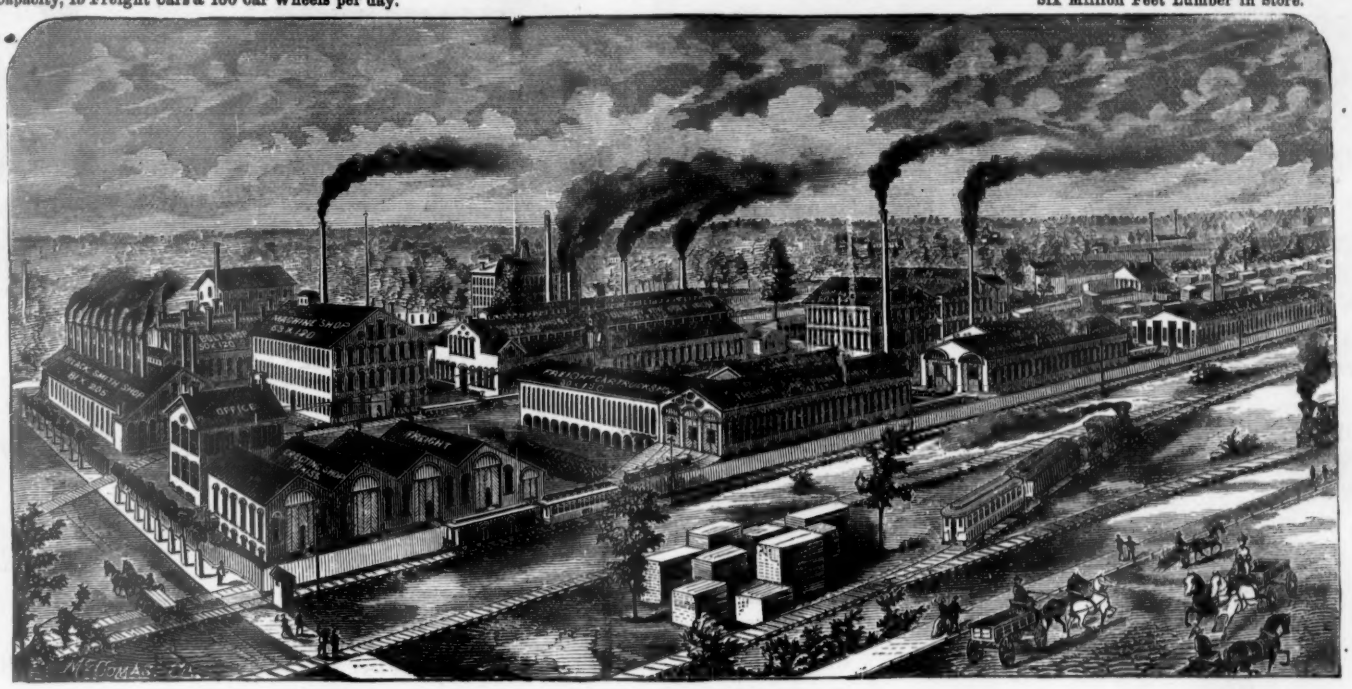

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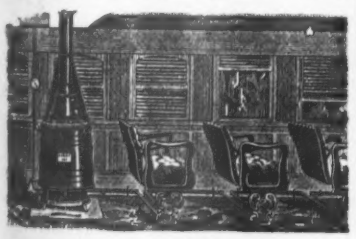

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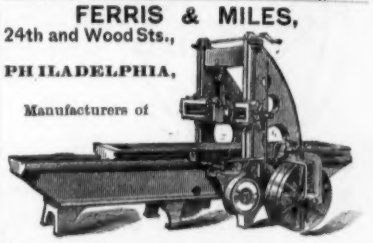

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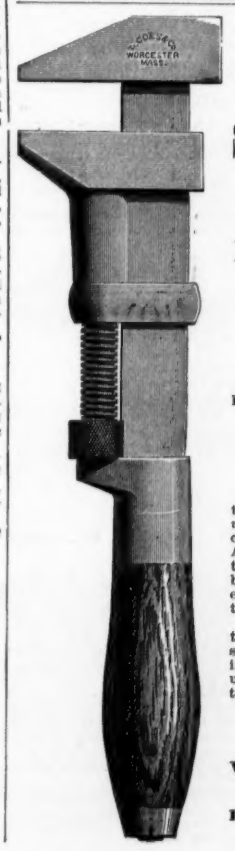

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Registered March 31, 1874.

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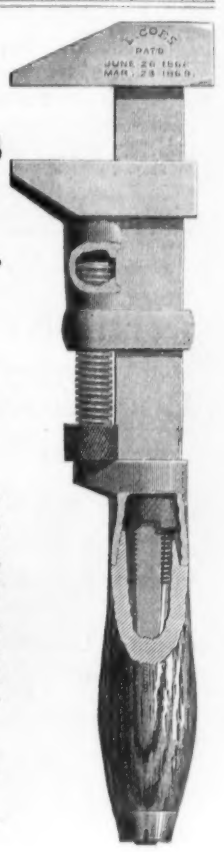

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Incorporated - - 1869.
CAPITAL, $3,000,000.

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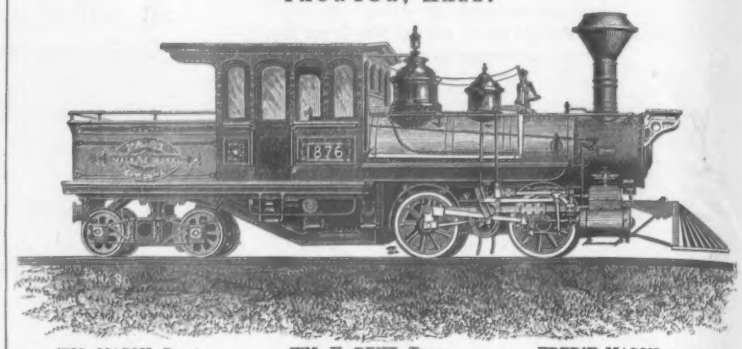

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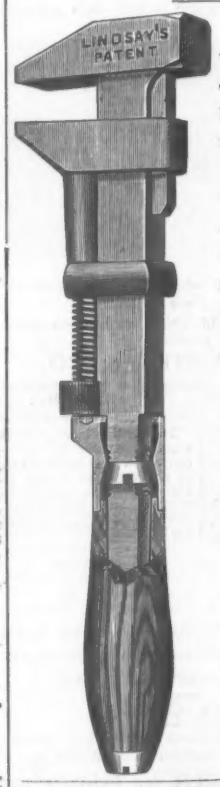

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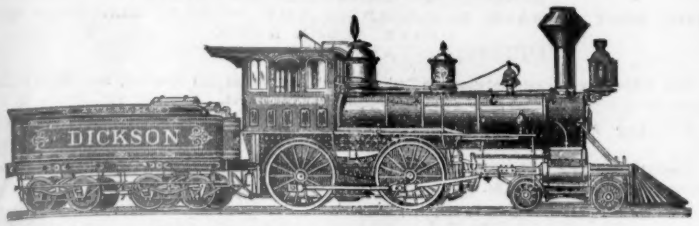

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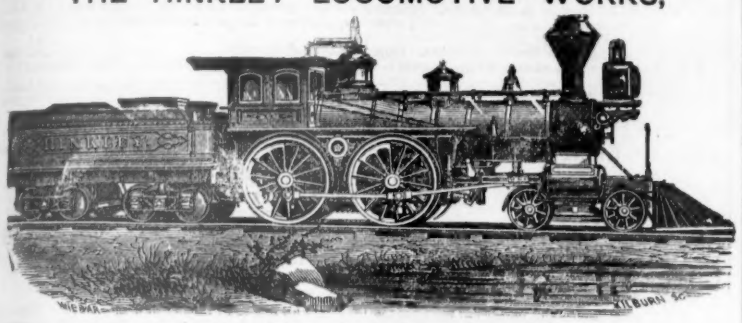

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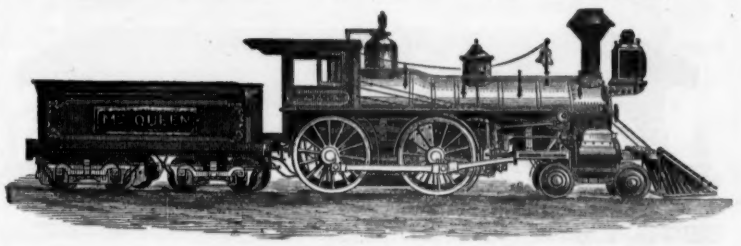

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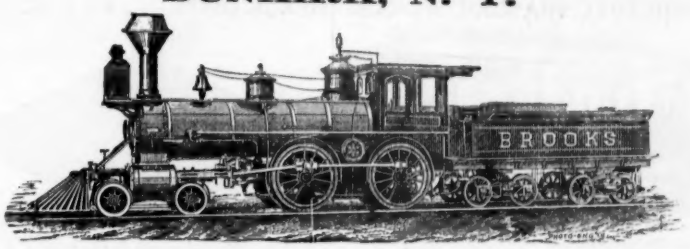

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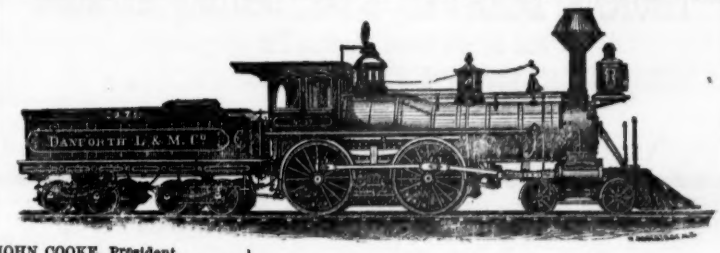

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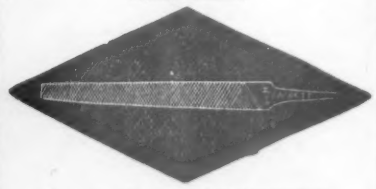

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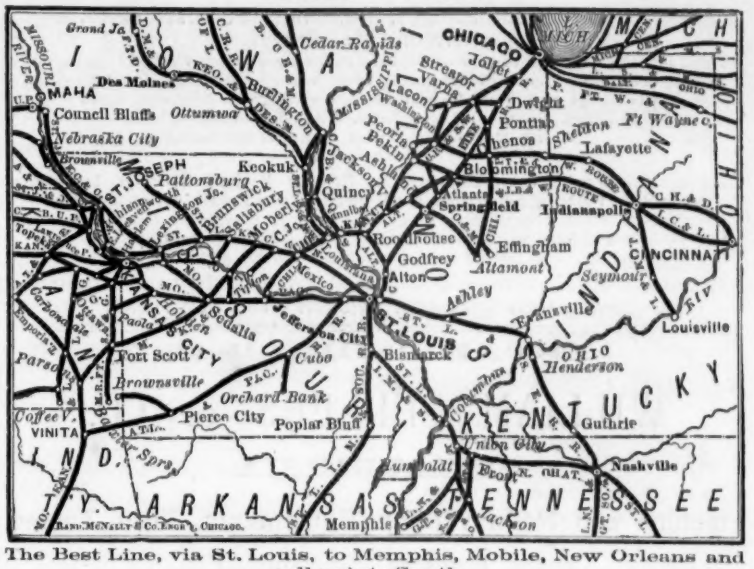

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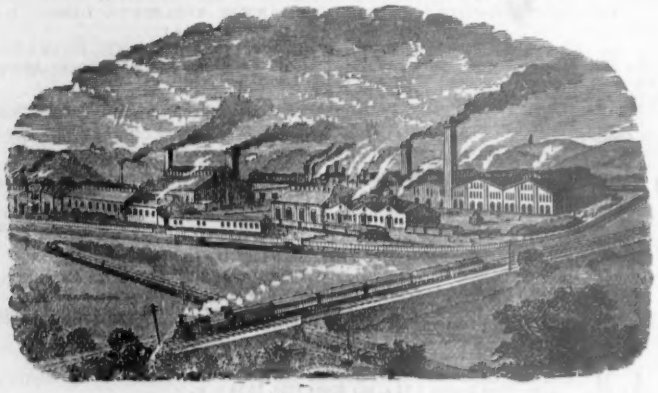

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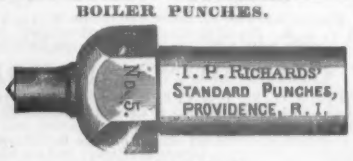

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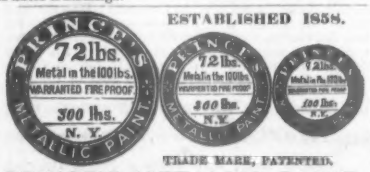

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